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44 What I like most is new ideas in software. Historically, one of the best new ideas was Borland's SideKick. SideKick Plus is a much more powerful program than the original. It adds a lot of new features and gives you a lot more flexibility over how you use its many features.

Michael J. Miller, InfoWorld 99



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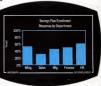
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mputer can do ut can it juggle

And since Symphony is from Lotus, it's compatible with a variety of other Lotus products which means Symphony 2.0, has no copy protection and comes with many new features, including enhanced database and word processing, a spell-

outliner, plus minimal recalc for file translation to other programs, as well as VT100

ing checker and text

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terminal emulation.

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with 1-2-3 users, for

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WHAT'S INSIDE

Reviewer Mike Falkper first put his skills to work for PC Magazine with his contributions to the accounting blockbuster we brought you in September. Since then, he's established a reputation around here for his insightful reviews, his good humor, and his capacity for hard work. He needed all three for his review of Nutshell Plus, which appears in this issue in Part 2

of our Project Data-



Persistence pays: reviewer Mike Falkner put his camcorder to work with his PC and stopwatch to benchmark-test a database.

It's not that Nutshell Plus was tought o crack. PC Labs database benchmark tests were designed to push packages to their limits—and Mike, a taskmaster, took them even further. None of the databases reviewed ran tests on our 50,000-record test file within the 3 hours altoted in the test guidelines.

But Mike, ever curious, didn't give up when time ran out. He sat up with his PC—stopwatch in hand, eyes glued to the screen. Hours passed. The clock was still running. Mike went out for fast food, but—determined to measure the import time—he hung his stopwatch in front of the screen, pointed a video camcorder at the monitor, and zoomed in to record the time and screen changes.

Mike captured the moment on film. His production won't threaten the ratings of "Masterpiece Theatre," but it stands as a great performance at PC Magazine. Also in this issue is contributing editor

Winn L. Rosch's review of IBM's 20-MHz PS/2 Model 80-111. The first 20-MHz PS/2, it arrived for

The first 20-MHz PS/2, it arrived for testing in PC Labs a full 3 months after the Compaq Deskpro 386/20. All of us were

eager to see if the long-awaited machine could match the raw speed of the Compaq—no one more so than Winn, who in an earlier review of the 16-MHz Model 80 declared it the "best-built personal computer ever."

"Times have changed since then. IBM is making even faster machines but so is its competition," said Rosch. "What's most important about the 20-MHz machine is the new direction it shows for IBM."

Users who are taking their personal computer systems in a new direction by installing the IBM version of OS/2 Standard Edition 1.0 will be interested in this issue's Lab Notes, in which Charles Petzold concludes his two-part series of step-by-step instructions for organizing the installation process.

And if aching fingers, small hands, or physical limitations are causing you grief whenever you try for the Ctrl-5 stretch on the now mandatory "Enhanced" keyboard, STAYDOWN, Jeff Prosise's latest utility and your fingers' best friend, can make those problems but a soon-forgotten memory.

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he PostScript laser printer sure to get high ratings at its network debut.

The new 8-page/minute QMS-PS 800 II laser printer The QMS-PS' 800 II is an 8-page-per-minute laser printer that combines the desictor publishing power of Adobe PostScript' with the sperior printer technology of roll years. Exceptional paper handling, faster processing speed and a Canon' CXD' print engine with 1000-page-per-month duty cycle give QMS-PS 800 II the versatility you need on your PC network.

A network sensation QMS-PS 800 II holds 500 pages, so operators aren't constantly refilling depleted paper trays. Users can even designate automatic switching between the two trays for doing letterhead/second page printing. Select faceup or facedown collation. And manually feed odd-sized paper stock.

With QMS ASAP" (Advanced System Architecture for PostScript) proprietary technology, QMS-PS 800 II delivers outstanding performance. In fact, the more complex though, the more it outperforms other Post-Script printers. Two megabytes of memory, examabable to three megabytes, also add to the overall page processing speed when you are creating complex documents.

Type casting The QMSPS 800 II comes with 35 resident by Pedeces (you can download more if you like). PastScript allows you to scale type to virtually any size, from minuscule to mammoth. PastScript allows sye us to design, and redesign, your documents with exacting detail. You have total control over the final appearance of documents, with the ability to place text and giaphics anywhere on the page. In short, you get the complete desktop publishing power that only PostScript can give prove that only PostScript can give post.

Critical acclaim The QMS-PS 800 II is certain to receive rare reviews on your network. And for a single-user set-up, there's the QMS-PS 810 laser printer. For a demonstration of either, call -800-523-2696 for the location of the Laser Connection dealer nearest you. And be sure to ask for The Sourcebook*
— our exclusive catalog filled with the latest laser printer products and enhancements.



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COVER STORY

IBM's PS/2 Model 80-111: A Dream Deferred Winn L. Rosch! Beaten by Compaq in the race to bring 20-MHz speed to the PC arena and threatened by the onslaught of dozens of traditional-bus 20-MHz 386 machines, IBM wants to score big with the 20-

10

wants to score big with the 20-MHz, 386-based PS/2 Model 80-111. No doubt about it, this is the fastest PS/2 yet—but how did it stack up in side-by-side benchmark testing against the Compag Deskpro 386/20? For all its promise, the new Model 80 may not yet be the star we were expecting. 93



The PS/2 Model 80-111's new memory card (right) holds 2MB dynamic RAM in 24 of IBM's own

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send documents four times as
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Cover Photograph: Roberto Brosan

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The Breakthru 286 performed flaviessly with every ap-tion we handed it, including convergeded programs a acted processes and e memory-resident utilities at once

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ichns 206 is a good take and a quality product backed

er of the AutoCAO Users Group The PCSG Breakthru 286 achieved the best performa results of the caching boords instal."

Ted Mirecki, PC Tech Insural (Rated #1)

The 12-MHz Breakthru 286-12 speedup board is the fo of those tested, but not the most expressive. On a dollar p homepower basis, it could be called the changest boost asso ble for an XI

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Breakthru 286-8MHz-\$395 LIGHTNING™-FREE with Breakthru Breakthru 286-12MHz-\$595 speedup hardware-\$89.95 purchased separately

We are excited about our three speedup oducts. You probably know about our Lightning disk access speedup software that was awarded PC Magazine's Best of 1986 award (see box). After the smashing success of Lightning, in late '86, we ut, no speedup board cuts disk access time in half

LIGHTNING

"Lightning is almost mandatory...." -

Steve Manes, PC Magazine

Best of 88 review

Loads with the DOS - always ready as a background

uaranteed the Breakthru 286 board to be terally the most advanced, fastest, most feature-rich board available. The runaway success it has enjoyed truly proved that assertion. Now we go ourselves one bet-ter with the Breakthru 286-12. This new board has the clock speed cranked up from 8 to 12 MHz for speeds up to 10.2 times faster than an IBM PC. It is 50% faster than an 8MHz IBM AT, and up to a whopping 1,000% faster than a regular PC.

HERE'S WHY THESE TWO ROARDS ARE SO SPECIAL. First, they install so easily, A half-slot card means you don't even have to give up

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a full slot. What's more, unlike competing

products it works in the Compaq Portable and most clones. Easy diagrams show how you just place the card in an open slot, remove the original processor and connect a single cable. There is no software required. From that moment you are running faster than an AT.

Second, they are advanced. The BREAKTHRU 286 replaces the CPU of the PC or XT with an 80286 microprocessor that is faster than the one found in the AT. Has a 80287 math coprocessor slot for numeric intensive applications. A 16K cache memory provides zero-wait-access to the most recently used code and data. Speed switching software allows you to drop back to a lower speed on the fly for

ming sensitive applications.

Third, you have full compatibility, All existing system RAM, hardware, and peripheral cards can be used without softvare modification. Our boards operate with LAN and mainframe communication products and conform to the Expanded Memory Specification (EMS). Software

compatibility is virtually universal. Faster and smarter than an AT - PCSG guarantees it.

Fourth, these are the best. There are several other boards on the speedup market. We at PCSG have compared them all, but there simply is no comparison. Many cards offer only a marginal speedup in spite of their claims and others

are just poorly engineered. We are really excited about these products. PCSG makes the unabashed statement that the BREAKTHRU 286 card represents more advanced technology than boards by Orchid, Quadram, Pi

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way. Users say "It is so intuitive that I really don't need a manual." That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid in a recent article said that. "If there ever was an interface idea so good it ought to be stolen and widely used, this is it."

What he was talking about is a new menu approach that follows a simple design concept: it is easier to recog-

Memory Resident

That's because the idea of a memory resident spreadsheet makes sense, one that you can pop-up instantly while working in your word thought a greatest the second of the computer should use? The last all., 1911 B for least the second of the last all., 1911 B for least the second of the last all., 1911 B for least the second of the last all., 1911 B for least the last all., 1911 B for

What

it so Special

Makes

In the

FIG. 1 Let's get the detail on those ad costs. Just move the widebar to that cell and press one key (grey +).

Abstricting June 199 (199 and 199 and

FIG. 2 Here we are, instantly. Notice the lower left corner showing we are on level 2. You can go down or up. (See next page)

processor or any other program. Lucid lets you cut anything on the screen and paste it right into Lucid, or cut anything from a Lucid worksheet and paste into the application below You can even run Lucid on top of 1-2-3 if you like, and cut and paste information from one to the other, including formulas.

Lucid 3-D was developed over the past two years with countless, exhaustive hours of planning and programming to produce something spectacular. This is a product that works the

multi-dimensional. Any cell of the special spe

other spreadsheet that you can exes with a single keystroke. It is as simple as the pictures show. And you don't have to write formulas to do that. All you do is go look at the through easy, point and shoot directores. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid works that

nize than it is to remember. As choices are made on a menu that take you to lower levels you always can see exactly where you came from and where you are going. The complete menu path is always visible. You cannot get lost several levels down. This means you never have to remember a command, you just flow right to It.



Any cell can contain a complete other spreadsheet that you can access with a single key.

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Plus, no matter where you are on a menu or what you are doing, just press function key F1. and you will get a help screen specific to that command or action. Or if you want to know about any subject you can pop up an index of over 400 topics and select the one you want.

Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note that you instantly access with a single keystroke. You can write



FIG. 4. Now, instantly we are on level 3. Each level is a different spreadsheet. You could now move to the New York Times and see the detail on that figure. There is no limit to the levels

notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

you can go. Move right down to transaction level if you like.

Speed

Lucid 3-D is truly revolutionary. It is fast, fast, fast! It is incredibly quick in performing calculations because it doesn't recalculate every cell every time you insert an entry. Instead, it only recalculates the specific cells that are affected by your change. This is called minimal recalc. Lucid also has a remarkable innovation called background recalc in which you are given control of the cursor the moment calculations affecting your viewing screen are completed. Other calculations you don't see continue on in the background during the next commands. The end result of this powerful combination is you rarely wait for a recalculation with Lucid. You find out what instantaneous is all about.

Lucid Learns

MINEAK - .

Lucid 3-D also lets you teach it any

combinations of keystrokes so that involved se-

quences can be.

done with single keys. Plus more than just remembering keystrokes. Lucid allows you to create Macros with loops. procedures and conditional branching amazingly all done automatically with simple menus. You can create your own menus that show the new features you have taught it. Another great feature is you can make your custom menus work like Lucid where

one choice can take you down a level to a whole new set of choices. What's nice is that they will work from one spreadsheet to another.

dieztisins FIG. 3 We want more detail, so let's go to Newspapers, Just press the Grey + Key The best idea I've seen for

fl for help or fill for west

a spreadsheet in years. lim Seymour, Columnist, PC Magazine, PC Week

Fi for help or F18 for men

Fig. 5. Of course, Lucid does multiple windows. Notice, you can simultaneously open windows in different directories different drives even down as many as 3-D levels as you like. No one else cando that.

Mouseability

Lucid 3-D was designed for both keyboard enthusiasts and mouse lovers alike. You can take your pick, Designed around the mouse from the ground up, the interface is smooth and natural. You select files to load from directory lists. Everything is point and click. What's more, any Lucid 3-D menu selection can be moused" and the response time is 'right now" instead of the sluggish "a little bit behind you" feel of add-on mouse menu systems like those

you've seen with 1-2-3.



FIG. 6 We need those budget figures in the Word Perfect letter we are writing. Clipboard Dump does it right now.

A window pops up with a library of function names you can page through with the mouse. Select, click and it's in the formula with no typing required. You even have a label window that you can fill (from the keyboard) with favorite labels and names so that you can insert them later with the mouse. There's even a pop-up calculator to insert numbers so you don't have to go to the keyboard very often.

It really permits that feeling of becoming one with your work. Lucid 3-D has windows of user defined range names as well as the macros named by the user that can be selected just by pointing and clicking. Icons that are easy to grab with the mouse let you resize and move the spreadsheet window with the ease you would expect. Plus you can go anywhere on the sheet by moving the mouse and clicking on the spreadsheet borders. And remember Lucid is designed so that any of those features are done with or without the mouse easily and quickly.

Audit

When you are staking a big decision on information gained from a spreadsheet you need to be certain that you have made no mistakes. Lucid offers five audit displays and printouts.

Masterwork

We could go on at great length about all the features and innovations in Lucid, but Lucid is more than a bag of features. What is most important is the pride and craftsmanship that went into its creation. It is a master-

s of LIGHTNING k speed up software, and PFAKETER 255 Accelerator Board.

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Enclosed are my estimates for the June 1908 Budget. To take a look at them, and see if they agree with your Expense Budget June 1988 Get back to me as soon as possible. Danks. James Johnson C:\REDGET\JOHNSON.WP Boo 1 Py 1 In 1

work. The overall feel is tight and polished. In fact, Paul Somerson, executive editor of PC Magazine, used one word to describe it. "Slick" PCSG has built a reputation as a de-

FIG. 7 Here it

Is right in Word

Perfect (or any

word processor)

just like you

typed it.

You can go

the other way

just as easily

velopment laboratory producing products that you know are excellent In 1983 PCSG dominated the Model 100 laptop market with ROM based software that every reviewer rated as excellent. In 1985 we produced **UGHTNENG** the pioneer and award winning Disk speed up software. In 1986 we developed the INVERTED TO accelerator board that blew everything else out of the water, and later we topped ourselves with the Breakthru 12. Now in 1987 those who have worked with Lucid 3-D tell us "you have done it again. This is software everyone should have:

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Pes 5

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large spreadsheet into many 3 Do you have to manually re-enter data that's duplicated in several

Do you have to manually manig

late rows into meaningful groups? Is recalculation time for seldomused reference variables eating

you alive? Do you wish you could simuftaneously share spreadsheet data with other PCs, as welf as with minis and mainframes

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ORACLE for 6-2-3 jets data relationships replace ever more complex spreadsheet formulas. No more time is wasted recalculating seldom-used reference cells. In short, ORACLE puts data back where it belongs. In a database.

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LETTERS TO PC MAGAZINE



GETTING THE FAX STRAIGHT

We were disappointed to see our product, Smartfax, misrepresented in William Taylor's article "Just the Fax" (PC Magazine. January 26, 1988). Strongline, a company

that had been considering distribution of Smartfax and that submitted a beta



each time you asked it to transmit, when, in fact, it does this only when you enter the program.

 that Panasonic's Fax Partner is the only product that includes a built-in image editor when Smartfax has one. ■ that the RAM requirement is 385K. It is

actually 640K that the list price is \$995. It is actually \$949

 that there are 17 jumpers on the board when there were actually 16 and that the manual listed 21 jumpers when, in fact, the documentation did not mention the total

Oversights in the review, which according to Mr. Taylor's own evaluation are very important, include: Smartfax's unique file conversion, capable of preserving special print functions such as boldface, underline, double strike, superscript and subscript; and the choice of file conversion methods that Smartfax gives the user-one saves a converted file for use in the graphics editor and one lets the user convert and transmit the file in a single

Finally, the Smartfax product currently on the market includes many additional features not on the beta that was reviewed. Of these, the most significant is PC Paintbrush file conversion. Its absence on the beta was criticized by Mr. Taylor as a maior shortcoming

Director of Marketing American Data Technology Pasadena, California

It's not our practice to review beta products. The distributor that sent us the board assured us it was a production unit and gave the reviewer the information on the pricing and RAM requirement. PC Magazine regrets errors made in the review and will review the Smartfax board now on the market in a future issue.-Ed.

NOT SO WEY

It's bad enough that Robert Hummel made that offensive, sexist, and crazy remark "Gee. I wonder if they have a braille edition?" without John C. Dvorak including it in his column (Inside Track, PC Maga-

 You would think that a magazine that deals with progress and stateof-the-art technology could get away from a prehistoric mentality.

zine, January 26, 1988). What's worse is that Dvorak insists upon calling the remark "wry" and says he was still chuckling over it "later that evening." Wry is not a word that any educated person would apply to that remark. You would think that a magazine that deals with progress and state-of-the-art technology could get away from this prehistoric mentality. Like some computer equipment, this "joke" was obsolete even before it made print, "Me man . . . you woman," he said, as he dragged her off to his IBM. Grow up! Karen Strauss

New York New York

CHECKMATE CHECKPOINT I believe Donald Trivette blew it big-time

in his review of CheckMate (After Hours PC Magazine, January 12, 1988). Mr. Trivette notes that incorrect entries cannot be fixed with the reconcile function. He is right in this narrow view; however, he ought to have tried the edit function. I have found it to be a real piece of cake.

All in all Thave found CheckMate to be a very useful utility. As I see it, its only drawback is that it doesn't have the canability to make me pay my bills before they are duc.

D. O. Williams, Jr. Silver Spring, Maryland

Donald Trivette's article on CheckMate (After Hours) left the reader with a very negative view of the program. For example, the article placed a great deal of emphasis on CheckMate's inability to place addresses on checks printed with the program, an omission of very little importance to me since most of the bills I pay come with preprinted envelopes. The review also completely ignored the pro-

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■ LETTERS

gram's ease of use, reports, calculation menus, ability to store 50 predefined payees, and so on

Although your magazine has a reputation for fair and accurate reporting, it really seems to be missing in this article.

Dan P. Fox Oklahoma City, Oklahoma

My three criticisms were that the program has no way to fix errors at reconciliation time, that the manual lacks an index, and that it won't print addresses for window envelopes. I stand by all three.

It's true; you can use the edit function to correct a check. However, the reconcile function still needs a way to fix errors: I find most of my errors while reconciling. And although other users may not mind that the program can't print addresses, I would be very anery at a review that didn't mention this fact since I print 40 or 50 checks a month.-Donald Trivette

WHO DONE IT?

Your review of the Lotus 1-2-3 add-in program Write-in ("Word Processing Addins." PC Magazine, January 26, 1988) states that Eric Shultz wrote the specs for the Add-In Manager before leaving Lotus to found Blossom Software. This is incorrect. I was the one who originated the idea of having an add-in manager for Release 2 and wrote both the specs and the production program. Eric's involvement was limited to the final debugging after I left to

 I was the one who originated the idea of having an add-in manager for Release 2.

write @BASE. Any claims to the contrary by Eric are without foundation. Don Selesky Westford, Massachusetts

Lotus acknowledges that Don Selesky and also David McCall made important contributions, along with Eric Shultz, to the Add-In Manager. The idea for the Add-In Manager came originally from the Lotus development team for Symphony; outside developers Paul Funk, Geoff LeBlond. and Bill Lynch approached Lotus and expressed interest in creating add-ins; Shultz, Selesky, and McCall then developed the Add-In Manager .- Ed.

OUT OF THE DARK

I am only a little embarrassed to admit that my PC hardware knowledge is limited. Although I had hoped your magazine would enlighten me. I was still feeling my way through terms such as dynamic RAM, stat-

ic RAM, memory cycles, clock cycles, wait states, and memory caching. Then I read Winn L. Rosch's article Anatomy of a 386" (PC Magazine. January 26.

ANATOMY OF A 386

1988), and I saw the light. It was not as condescending as some articles I have read that are geared to the beginning PC user, and yet not as haughty as others whose audience must be MIT computer-science master's-degree holders. Thank you Mr. Rosch, and thank you PC Magazine.

Kent A. Mezger Cincinnati, Ohio

In a recent article by Stephen Manes, he points out how MS-DOS is still too hard to learn and use even after many revisions ("Type 'Type': How's That Again?" PC Magazine, January 26, 1988). This is true, but many would agree that reading PC Magazine for a period of time makes the function of MS-DOS as well as other aspects of the IBM standard of computing more understandable. Articles such as "Anatomy of a 386" keep us well educated on the latest developments in this everchanging technology. I look forward to learning and exploring how the new 386 micro chip and the OS/2 operating system will affect the way we use computers. Thanks to all the staff of PC Magazine for making personal computing more understandable.

> John Carno Elizabeth, New Jersey



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LETTERS

TURBO POWER

Neil J. Rubenking's article on Turbo Pascal 4.0 (PC Lab Notes, PC Magazine, January 26, 1988) provided an excellent intro-

■ The answer to the DOS problem is to focus on it and solve it, learn the rudiments of the

subject, and not moan.

duction to this powerful new programming environment. Keep up the good work—you always seem to deliver just what I need at the moment!

Douglas A. Kerr Dallas, Texas

I thoroughly enjoyed your recent issue covering Turbo Pascal 4.0 (PC Lab Notes) and providing the PAINT program by Jeff Prosise (Utilities, PC Magazine, January 26, 1988). As always, your timing was right on the money.

Christopher H. Hall

HELP FILE HELP

Help! Although I really enjoy the PC Magazine Help Files that you've been publishing, I seem to be missing one. In the Febmary 16, 1988, issue, you stated the Help File in that issue was sixth in the series, and yet I have only five in my possession. Am I really missing one, or did y'all make a misprint?

> Thomas F. Hamlyn Houston, Texas

Oops, you're right. The PC Magazine Help File in the February 16, 1988, issue was only the fifth in the series.—Ed.

REALLY NEAT

Quoting from Stephen Manes's column "Neatness: It Really Does Count" (PC Magazine, January 12, 1988): "Neatness is highly temporal, Many

things were neat when they arrived, but

aren't anymore. The Tandy Model 100. The 10-megabyte hard disk. *1-2-3*. ATclass speed."

I don't know about the other items, but y Tandy 100 is still neat! 19ought a To-shiba T1100 Plus when they came out, but after one trip to Hong Kong I put it on desk and it has stayed there ever since. The Toshiba and others like it aren't really portable—the Tandy 100 is. In fact, the 100 is still the neatest machine around for truly portable writing.

I. Switzer Palm Springs, California

THE DOS SOLUTION

Stephen Manes's column "Type "Type': How's That Again": (PC Magazine, January 26, 1989) brought a smile of not-so-fond recognition, with its Abbott/Costello (consultant/client) keystroke-by-keystroke telephone conversation.

John T. Lowry Billings, Montana

CORRECTIONS/AMPLIFICATIONS

The correct phone number of Boston Documentation Design (Connectivity Clinic, PC Magazine, January 26, 1988) is (617) 965-5300.

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PC EXPRESS ANSWERS THE MOST ASKED QUESTIONS ABOUT THE NEW CLIPPER"-SUMMER '87

What Does The Clipper Compiler Do? Clipper TM compiles dBase III TM and dRase III PlusTM source code programs. procedure and format files into a binary program which can be distributed and

executed independent of dBASE. How Much Faster Is Clipper Applications run up to 20 times faster than the same application in dBase III or dBase III Plus. The average application typically runs 5 or 10 times faster.

How Compatible Is Clipper With dBase III and dBase III Plus?

Clipper supports the majority of dBase III commands except those that are normally used interactively. There are some minor differences in the implementation of some

DBF, FRM, MEM and LBL files are the same as interpretive dBase III. Clipper index files have the extension .NTX (corresponding to dBase NDX) and result in faster indexing and more efficient use of disk space.

NEW VERSION: **CLIPPER SUMMER '87**

- · compatible with Microsoft C · dBASE NDX file compatibility
- option · drastic compile-time and run-time
- speed increases
- · complete file I/O control
- 255 open files utilizad DOS 3.3
- · enhanced error handling · enhanced debugger
- · powerful menuing command · interactive command simulation (BROWSE)

Does Clipper Support Networking? Yes. Both versions Autumn '86 and Summer '87 allow you to run compiled applications on most popular networks. They

feature record and file locking and support Expanded Memory. A second work station may view or read a locked record or file and produce reports. However, an operator of the second station cannot update or write to a locked

record or file Do I Need Any Kind of Runtime Mod To Run A Clipper Compiled Program? No. Clipper produces an object code module with the extension OBJ. When the OBJ file is linked (using PLINK86 which is included) a relocatable file with the exten-

sion EXE is produced which can be run directly from DOS Do I Need Clipper For Every

Program I Distribute? No. You can compile and distribute as many programs as many times as you wish. Nantucket charges no runtime or royalty fees for distribution of your compiled applications.

Are There Royalties For Adding Work Stations?

No. Clipper places no limits on workstations. You may add as many work stations as your networking software will allow with no additional fees.

Does Clipper Handle Memo Fields? Yes. Memo fields can be stored as string values, allowing them to be searched, con-catenated and REPLACEd, ASCII text files can be read into memofields and memofields can be read into ASCII text files.

What Size Are Clipper Compiled .EXE Files?

The minimum size Clipper file is about 145K. This overhead is a one time ex pense and is present in even the smallest program. DOS requires 30-40K of mer ory. In addition, Clipper requires 64K for its own purposes once loaded, which means that in a 256K machine you could load a program of about 160K into RAM. If you create a program that exceeds your computer's memory, you may create

overlays to work around the problem. What Are Overlays? Overlays are portions of your application

that will NOT reside in your computer's memory until executed. An area of memory is designated for overlays by the linker. You then specify which portions of your program are transferred in and out

of that memory area. In What Language Is Clipper Written? Clipper is written in the Microsoft C (5.0) language with some assembly language

Does Clipper Allow You To Create Windows? Yes. With Clipper's new SAVE SCREEN

routines

dBase III and

dRase III Plus

ace trademarks of Ashton-Tate

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of Phoenix Software Microsoft Windows is a

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REAL PROGRAMMERS DON'T USE dBASE. OR DO THEY?

We're finding that some very swift pro-grammers are using dBASETM to write some very fast applications, and are completing their projects much more quickly. But they cheat

They use the ClipperTM compiler to ombine dBASE with C and assembler. With dBASE used like pseudo-code.

they can then quickly create prototypes that actually n Then, with dBASE doing the high-level database functions, they use the Clipper compiler to link in C or assembly lan

mane modules from their own bag of And they're finding that they're linking in less than they expected because Clipper compiled code runs so fast and be-

cause of Choper's built-in enhancements. Choper includes . Easy networking that provides file and record locking the way it should be

. Fast screens that can be treated as memory variables and eliminate the

need for direct screen writes and all that torturous heap management code Box commands that made windowing a

breeze And more So if you'd like to use your time more productively, check Clipper out

and RESTORE SCREEN commands windows can be created and manipulated.

Will Clipper Interface With Microsoft Windows TM? Chipper will run and compile with Micro-

soft Windows TM but will not run as a separate task Is Clipper Limited To 640K Of RAM? No. Chipper employs the Lotus/Intel/

Microsoft™ expanded memory protocol allowing use of up to 1 megabyte of RAM.

What Hardware Is Required To Run Clipper? Clipper runs on any IBM PC, XT, AT, 3270

or 100% compatible machine running DOS 2.0 or greater for single user applications. Networking applications run on most major networks supporting DOS 3.1 or higher.

Is Clipper Copy Protected?

No. Copy protection was removed wit
the release of the Autumn '86 version tion was removed with

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C-TREE & R-TREE

B-Tree File Manager Now Has Report Generator

coding usually artisaled Once you link a description of the

field characteristics of the data files in the r-tree library, you are tree to use an

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searches you the findings into new logs cal records, sort them, calculate new

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c-tree: The only many b-tree file manager that comes with built-in network support rather than a costly separate VERSON, CREWTM is sturdy code has weathered many seasons of pro in C source, so you can modify it to fit a special case, permits any number of keys for a data file-alpha, numeric, even floating pour handles files with varied record lengths, and multiple keys in one tricks file. In short, you get the works—and there are no royalties. C-tree's design splits nodes to allow any number of users to access an index file smultaneously even when updates are in progress. So multi-user configwaters and adaptation to networks are possible Record-locking routines are provided for DOS 3 x, UNIX XENIX Cities can travel Tests in many envi-

fields and columns, tabulate by any number of control breaks. Yest synchro seport mages—not just rows and col-umns, but customized layouts r-treeTM comes in source code and is designed for the same portability offree rormen's prove that office gives your arminutes a notest to anothers

r-tree: thousands of o-tree users (and you now have a suddenly expanded

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Quality software? IBM thinks so They oll CSS under their own label. Royalties

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genious demo call for it Worthy Call with Forms Library BASTOC BASIC Into C For a trifling price, BASTOCTM moves truckloads of BASIC code over to C. If a a translator which takes in Microsoft Exlended BASIC and emits pure K&R C for mic string allocation ends BASIC's cata toric halts for garbage collection. Huge

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POLYTRON VERSION CONTROL

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An application generator (QUICKCODE PLUS), relational report water (QUICK-REPORT), and graphics system.

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QUICKCODE PLUS offers dozens of features you've never seen before in a dBASE code generator. Relational apply cations that read, duplay, and update a dozen or more databases smultaneously Real-time" calculations, performed on screen as the user errors each field ability to pass data between screens slas that out cally combine data from different data bases. 9 Data types. 16 field types

(ake bold and stafics), computed fields and up to 16 levels of totaling and sort duces bar, pse, line, and psebar charts directly from dBASE data. Dozens of op-

QUICKREPORT is a full-featured rela-onal report writer, which combines up to 6 databases in one report, handles many to-one relations, fancy printer features

WALLSOFT'S THE UI PROGRAMMER you've designed. Once you have a form Code generator for dBASE

The UI Programmer was developed for

professional dBASE programmers who have been frustrated in the past by code generators. Up until now, a serious dBASE programmer had to take what ever code a generator produced and modify it to their needs. With UI, the UI (User Interface) has two main func-tions, the first is a powerful forms editor

to create sophisticated screen and menu-forms in a matter of minutes. The editor is completely menu-driven. It works on the 'poss-and-shoot' principle-just put what to put there tion is generating code for the forms

you've designed only on call up the the way you want if, you call up the 'Generate' menu, and tell UI which tem plate you want to generate the code with That's the key—each template tells UI to produce a different kind of dBASE

program
It shrough these templates that you can program the way UI generates source code. You can use the templates that come with UI "as is (there are about 25 of them), completely rewrite. hem, or write your own. So you don't lose control of design, like you do with other generators. You tust let UI do the

DOCUMENTOR

dbase at the speed of C dBx Translates dBASE Applications to C

You dBASETM programmers know what an expressive and readable language dBASE is it's a very comfortable devel coment environment. But the price is debased performance. Even compiled dBASE doesn't offer the speed that some GBASE doesn't other the speed that some users require these days. The lond of speed offered by software written in the Clanguage. The answer is dBxTM, dBx manulates dBASE to C. It offers you

a major competitive advantage over the next dBASE programmer. Keep writing in dBASE. Take every application all the way to completion. Then use dBx to translate them top to bottom to C Other advantages C is portable. to other operating systems like UNIX/ XeruxTM. To the Macintosh or Amica dBx gives your applications a passport to

places dBASE cannot go Has its own file manager for single user, but links to major C file manager tree and dBC—for companions with dBASE files or multi-user support. We

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BRIEF/dBRIEF The Power Environment for dBASE Programming

Many worthy utility products supply needs that dBASE* is programming lan-guage doesn't—dUTLI'M, dFLOW'TM and a host of others. Trouble is, you have



to use them separately, then combine their output into your dBASE program No longer dBRIEFTM written in

BRIEF and turns it into a complete dBASE Ill and Ill Plus progressimmy domain Using BRIEF's underlying shell capabili-

tible with Clipper and APPLICATIONS PLUS 5490

QUICKCODE PLUS

hes and as OWN memores, plus dBASE fiself, and link to the ClapperTM. Foxbase +TM and Quacketiver compilers all with dBREF still loaded and running the show it can do what BREF shready. . Convert a screen layout into dBASE

ode for interactive data entry • Display dBASE file structures in indows, a great co your program files

• Expand keystrokes into full dBASE

 Indent automatically for clear. Create databases, index files, invoke

Ashon Tate's dFORMATTM and dCONVERTTM, draw lines and boxes "Simply marvelous programming en-vironment for writing and editing dBASE programs", PC Magazine, 7/86 Source

Requires BRIEF I 32 or later and 384k. 512k to run dBASE within dBRIEF, 640k and harddask recommended

BRIEF/dBRIEF Lot \$275 Ours call

dBC Identical dBASE III Plus Files Using C

BCTM is a sense of C libraries from updates files identical to those of dBASE treelf. So dBASE can read and update the

What for? It means both C and dBASE data bases interchangably it means C programmers can interface with the bag market of dBASE users out there, yet side-step the dBASE language. It means dBASE applications can now be lasked to the universe of C libraries and tools to add windows, graphics, statistical an sis, all the things dBASE cannot do. B means the speed and power of C nts accustomed to dBASE dBC's functions parallel all dBASE's file handling commands, many decomposed

to permit direct data manipulation. Ten each of data index and memo files man be open at once it is so complete an ISAM package that you can forget dBASE and for dBASE II and III and now dBASE III Plus makes your programs network ready! - as many stations as a network allows. Hands-off mode handles record and file locking and unlocking automat

scally Close in functions gave you direct lock/unlock control Supports all four memory models Specify compiler and dBASE version Call for Source Pricing dBaseII, III Last \$250 Ours \$169 For dBaseIIIPlus Last \$750 Ours \$499

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timizer or a RAM disk. In fact, Over Ours \$69.95

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PC ADVISOR



Help in choosing among the ANSI-77 standard FORTRAN compilers for the PC, and in uperading a standard five-slot PC with a 386 processor. eral attractive options no matter which

386 TNG A PC

I've been considering trading up to a lowcost AT or installing a 386 motherboard in my old five-slot IBM PC-upgrades I'm guessing will cost about the same. Which is the better way to go?

Thomas J. Twardzik Memphis, Tennessee

Which route you should choose depends largely on personal preference and how you use your machine.

Upgrading your PC to an 80386 machine offers several advantages. The obvious advantage is the increased speed. Your properly upgraded PC would easily outrun an 8-MHz AT in most situations. More important, however, is the flexibility a 386 machine would give you in the future. Though either a 286 or 386 machine will run OS/2, software manufacturers have already marketed other powerful environments, such as Microsoft Windows/386, MV/386, and DESQ-View/386, that take advantage of the awesome power of the 386 and run only on 386-based machines.

There are also advantages to buying a new AT machine, however, One obvious advantage is the newness of the equipment. Your PC's keyboard, hard disk (assuming you've added one), floopy disks, and other equipment won't last forever. Other advantages include more slots than the five in your PC and a faster hard disk. Overall, you'd have a system that operated more smoothly and that left you plenty of

With that said and done, you've got sev-

route you choose. If you decide to install a 386 motherboard in your PC, a task that's surprisingly easy, your best bet is the Hauppauge 386 Motherboard (\$1.495: Hauppauge Computer Works Inc., Commack, N.Y.: (516) 360-3827), The Hauppauge runs at 20 MHz and comes in a fiveslot version for PCs and an eight-slot version for XTs.

As a much less expensive option, however, consider going with the Inboard 386/PC (Intel Corn., Hillshoro, Ore., (503) 629-7354)-a \$995 board that plues into one of your PC's slots and delivers 16-MHz performance. The Inboard won't boost overall system performance quite as much as the Hauppauge, and you won't get any 16- or 32-bit expansion slots, of course. But this excellent product offers more bang for the buck than anything else around.

If you opt for an AT compatible (IBM no

 If you decide to install a 386 motherboard in your PC, a task that's surprisingly easy, your best bet is the Hauppauge 386 Motherboard.

longer offers the True Blue AT), you've got countless attractive options. Peruse your back issues of PC Magazine for our frequent roundups and reviews of AT compatibles to find a machine in your price range that suits your needs. Our most recent feature concentrated on machines costing less than \$1,500 ("The Cheapest ATs Ever," PC Magazine, February 16, 1988).

FORTRAN FOR THE PC

While reviews for BASIC and Pascal compilers abound, I am at a loss to find a FOR-TRAN compiler for the PC. My main concern lies in the completeness of the error messages and in adherence to the ANSI-77 standard. I am an undergraduate student majoring in mechanical engineering.

Herm Harrison Cincinnati, Ohio

Three FORTRAN compilers for the PC deserve mention. All adhere fully to the ANSI-77 standard and add the popular extensions, such as IBM/VS and DEC VAX extensions. All also make use of similar error messages. Your choice will depend upon the cost and upon other features of the compilers.

Lahey Computer Systems Inc. (Incline Village, Nev.; (800) 548-4778) markets several FORTRAN compilers, each meant for a different class of user. The \$95 Lahey Personal FORTRAN 77 offers the full ANSI-77 standard (though not the extensions) and an on-line debugger, but it limits program size to a maximum of 64K. F77L, the original of the Lahey line, is a more powerful version of its cheaper sib-

■ PC ADVISOR

ling and sells for \$477. F71L supports most popular extensions to the ANSI-77 standard, offer a maximum program size of 640K (minus operating system), and supports interfaces to Microsoft Macro Assembler and Lattice C. An upcoming version will provide an interface to Microsoft C. Lahey also offers 16- and 32-bot-vion and support programs of virtually unlimited size.

Microsoff's extensive line of compilers includes Microsoff PORTRAN (4856; Mi-crosoft Corp., Redmond, Wath.; (809) 426-4040; (206) 882-8080). Microsoft FORTRAN supports a maximum program size of 60K and buckets Microsoff speular CodeView debugger. Perhaps the biggest advanage this compiler offers, however, is its dishlity to interface to several compilers across the Microsoft Macro Assembler, C, and Pascel, and Quick-BASIC 4.0. Inmid-Feb-

ruary, Microsoft is scheduled to ship Version 4.1 of the FORTRAN compiler, which will allow development of programs for the OS/2 environment.

Austec Inc. (formerly Ryan-McFarland

■ Lahey markets several FORTRAN compilers, each meant for a different

class of user.

Corp., Rolling Hills Estates, Calif.; (213) 541-4828) sells its RMI-FORTRAN compiler for \$595. RMI-FORTRAN ships with a sophisticated program development environment that takes a project management annrageh to applications development.

The environment includes an interactive editor and debugger and automates program compliation and linking, Maximum program size is 640K, and the compiler supports interfaces to Microsoft Macro Assembler and C compiler, Austec wrote IBM's FORTRAN2 compiler, Austec with the Compiler and the FORTRAN compiler IBM now ships for OS/2 development. Austec Will begin shipping its own version of that compiler soon.

Assuming that your finances are as tight as mine were as an undergraduate, your best bet may be Lahey's 895 compiler. You'll probably find all the features you need. And if you outgrow that compiler, you'll be able to take advantage of Lahey's \$50 upgrade to the more powerful F7TL compiler.

ASK THE ADVISOR

Send your questions to PC Advisor, PC Magazine, One Park Avenue, New York, NY 10016.





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OTHERS PALE B



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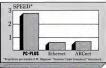
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FIRST LOOKS

dBASE IV Getting a Major **Overhaul and Speed Boost**

HANDS ON

BY GENE SMILGIEWICZ Editor's note: PC Magazine feature reviews and Hands-On First Looks are always based an experience with a finished product. Previews are based an hands-on experience with an early version of a product. When dBASE IV is released later this year, an evaluation of the final praduct's performance will appear.

Circa four score and seven months ago, Ashton-Tate brought forth its first version of dBASE. Since then, each new release has been greeted with al-



The Browse mode will affer more than just a mere look at a dBASE IV file. Searching, appending, and deleting of records will be possible through the pull-down menus. You will be able to adjust field widths interactively.

most as much criticism as praise.

It looks like Ashton-Tate may finally do it right when dBASE IV is released later this year. With a new interface and over 200 new or improved features, IV will be 100 percent compatible with III Plus programs and files. Performancewise, IV-played applications will run rings around III-based versions with speeds comparable to FoxBASE and Clipper. The programmer-oriented Developer's Edition may even win back developers who have opted for clones

To start off, the III Plus Assistant has been replaced by the

New \$725 R:base Understands Limited SOL and Runs Faster

HANDS ON

BY NEIL J. RUBENKING Microrim's R:base has come a long way. Series 4000, 5000. and System V steadily added power and speed to the product. The latest version, R:base far DOS, includes SOL (Structured Ouery Language) support and sets the stage for an OS/2 version, due out in a few weeks, that will match this version, feature for feature.

R:base for DOS lets you create and test a database or application without leaving the sys- | city = Paris) OR (state = IL tem. Moving from the database itself to the other modules (Forms, Reports, editor, and so on) is faster than in System V. However, users of common word processing programs will find the RBEDIT editor counterintuitive.

R:base far DOS allows logical grouping of conditions in Where clauses using parentheses. Previously there was no easy way to select, say, residents of Paris, Texas, or San Jose, Illinois. Now you just write Where (state = TX AND

AND city = San Jose).

R:base for DOS uses the same file structure as R:base System V, and all the old commands still work. You may need to make some minor changes, but for the most part your System V databases and applications will work with the new version

Prompt By Example makes using R:base easy. If you know what command you want, type PROMPT followed by its name at the R> prompt. If you know (continues on page 35)

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Turn spreadsheets into

A disassembler that's worth the money

JETSCRIPT PostScript for the HP LaserJet II4

ARASE IV

Control Center, a much more elegant and effective interface Consisting of a menu bar atop a 'work surface," its style of screen organization, along with consistent function-key assignments, flows through underlying utilities.

The Control Center relies upon "catalogs," files that define sets of associated databases and their ancillary format and program files. Not merely a holdover concept from III Plus. catalogs enable the Control Center to present a complete overview of the "objects" con-

stituting an application. Cataloged files are listed alphabetically, according to their function, in task panels on the Control Center's work surface. From left to right are dFILES. Oueries, Screens, Reports, Labels, and Applications panels. Each panel's list is headed by a <create>" option

When you select-pointand-shoot style-any object in a task panel, the Control Center activates a relevant utility or responds with a dialogue box to determine further action. For example: selecting <create> in the dFILES nanel initiates the menu-driven file definition procedure; selecting an object, then pressing the Del key lets you specify that the object should be removed from the catalog or deleted entirely.

The Control Center handles multifile relations and operations easily. From the Queries panel you can invoke the Paradox-like Ouery By Example (OBE) processor that makes full use of IV's new multiple-"child" canability. You specify the files to select, fields to project, and how files are to be joined to create a virtual database including only qualified elements. These "logical" views of data can be sorted, filtered, summarized, even updated.

From the Reports panel you will enter a world hitherto unknown to dBASE users: a decent report writer. Using a selected database or multifile view as a basis, you visually lay out columnar, form-based, or mailmerge reports. Your reports can consist of an introduction, page headers and footers, numerous group headers and footers, a very flexible detail line, and a summary page. These seven types of "bands" can include text, database fields, and calculated fields. Numerous font and attribute options are also available. If you just want a simple report, choose the "Quick Layouts" option from the Layout menu to have IV do everything

for you This approach is carried over to the Forms and Labels utilities. When designing data entry

space, will now be editable. IV's ApGen makes its pitiful predecessor seem Stone-Age in comparison. It seems canable of generating truly complex application programs. The Developer's Edition even includes a template processor to guide its code writer according to your style and preferences. You select database and for-

mat objects and specify the operations to perform. Resulting applications can have a highly customized interface utilizing customized sign-on screens menus, pick lists, color, win-

screens, you will not only have dows, and user-defined help. SCRIPTIO DODOCCOMMONDO Birmi B.Coliff | File:PC.38F The report preparation for tilty is dBASE IV is being greatly improved. Field no can be pointed onto a template, and field names can be changed for the report.

control over the placement of

fields and descriptive text, you will also be able to specify editing and validation criteria. Memo fields can actually be displayed properly. You can use a Quick Layout option to have IV set up a basic screen that can be

altered easily. Whenever you build a new format or query definition, the Control Center generates short, modifiable dBASE programs. You can tie these objects all together in the Control Center's Applications panel.

When you elect to create an application program, you can do so from scratch or automatieally. Those who write code in the traditional manner will appreciate the new program editor with its search and replace. block manipulation, and 1,024character line lengths (the new limit for command lines). Large files, limited only by disk

Even the Quick Application option generates impressive-looking programs with a minimum

of interaction.

dBASE IV now supports the IBM SAA (Systems Application Architecture) standard for SQL (Structured Query Language) as implemented in IBM's DB2 and SQL/DS, adding another 100-plus commands

to the language. You can set up your applications where both dBASE- and SQL-created files are used by programs intermixing SQL statements with a large subset of dBASE statements. You can also operate SQL from the dot prompt, switching from dBASE to SQL mode. Language and environment

extensions now permit 2,048 memory variables, 255 fields per record, 1,000-character command lines, and 99 open files (only ten .DBFs, though). Programs can now include user-

defined functions and two-di-

mensional arrays. Thanks to SQL, IV's multiuser features are light years ahead of III Plus's with automatic record and file locking with dynamic screen refresh. eight-layer password protection, and data encryption. For the pièce de résistance: transaction processing mode with rollback capability. Not only can you recover easily from a failed lock condition, you can even restore data and index files corrupted during a power interruption or network failure (or so Ashton-Tate says).

This new code, when first invoked, will be run automatically through the new, built-in compiler. The intermediate object code files created are subsequently executed more quickly than interpreted source code, Developers can create standalone executables with the advanced version.

dBASE IV will need 640K RAM. If my experience with the beta is any guide, you will have to unload all your memory-resident programs if you want to avoid 'insufficient memory" roadblocks. Naturally, IV will require 2MB RAM under OS/2

dBASE IV is scheduled for release by July 31 with a \$795 list price; an OS/2 version is scheduled to ship soon after. A LAN Pack for five network users will run \$995. The Developer's Edition will set you back \$1,295

Ashton-Tate has dealt with most of the major deficiencies of III Plus and thrown in a few forward-looking features on its own. I haven't even mentioned the new macro capabilities, expanded import/export ontions. and DOS shell. Or the advanced debugger and the load of new financial, statistical, and math functions

However I have to remain somewhat skeptical about how well all these improvements will be implemented. Every maior new dBASE release has been fraught with bugs and anomalies. We can only hope that Ashton-Tate transcends its track record and delivers a product that is worthy of the design effort that went into it.

R:base

(continued from page 33)

only the general nature of the task, hit Esc at the R> prompt to get into the PBE menu system. Here you select topics such as Query the Database or SQL commands

When you've chosen a command, R:base prompts you for every argument to that command. If the argument is a table or column name, R:base presents a list for you to choose from. As you answer the prompts, you build a command at the top of the screen. When the command is complete, you check for accuracy and then execute.

Express modules automate the tasks of creating databases and applications. Define a database with Definition Express, build its input forms with Forms Express, control the output with Reports Express, and bind the whole together in an application program with Applications Express.

The new Developer's Express module consists of an enhanced version of the CodeLock tokenizer, RComp, and a runtime module for R:base. RComp turns an R:base command file into a binary file, and RRun executes that file. RComp speeds execution by analyzing the program at compile time (the R:base compile does not produce standalone .EXEs. just tokenized R:base code). For example, it catches syntax errors and converts flow-control commands like While, If, and GoTo into absolute references. As a result you cannot use all R:base commands in compiled applications. The Developer's Express that comes with R:base is strictly for your own use. Microrim will soon release Developer's Express Unlimited. which will allow you to make an unlimited number of copies of the runtime module for distribution

R:base for DOS incorporates 15 important SQL concepts into the R:base language. For example, the new Grouped By element allows you to get information about classes of objects with a Select command. If your application steps through a data-



R:base for EXIS can call SQL commands via Prompt By Example selection. Unlike the dBASE longuage, R:base programming syntax had no existing conflicts with SQL, so the SQL commands are easily mixed into R base queries.

base using a Pointer and variable assignments, you can speed things up with the new Declare and Fetch statements. And naturally you can call the SOL functions under Promot By

Example. The security system is more precise-you can separately

UDDATE

UPDATE (w/ GRANT/REVOKE)

alter existing data. DOS package serves up to three

concurrent users on a network. You can purchase six-user and unlimited-user versions for a higher price. R:base guards against more than one user modspecify who may add data, who ifying the same data at once,

may delete data, and who may

The standard R:base for



R:base for DOS Microrim 3925 159th Ave., NE P.O. Box 97022

Redmond WA 98073 (206) 885-2000 List Price: \$725 (one to three users), \$995 (up to six users). \$2,695 (unlimited users). Upgrade: \$99, \$200, and \$300, re-

spectively. Requires: 512K RAM (640K per workstation for network use); two disk drives; DOS 2.0 or later for single user. 3.1 or later on networks, 3.3 or later

for PS/2. In Short: A new and faster R:base with more features. Not copy protected CRICLE ASMON READER SERVICE CARD

and the detailed SQL security system allows many distinct levels of access.

SQL Commands and Their R:base for DOS Counterparts

SQL command	R:base equivalent	Description
ALTER TABLE	EXPAND	Add column to table
CREATE INDEX	BUILD KEY	Create key index
CREATE TABLE	TABLES	Define a table
CREATE VIEW	VIEW	Define a view
DECLARE CURSOR	SET POINTER	Set a row pointer
DELETÉ	DELETE ROWS	Remove rows from table
DELETE (w/ GRANT/REVOKE)	MPW	Control removal of row data from table
DROP INDEX	DELETE KEY	Delete key index
DROP TABLE	REMOVE TABLE	Delete table
DROP VIEW	REMOVE VIEW	Delete view
FETCH	NEXT	Advance row pointer
GRANT	PASSWORDS	Give access privileges
GROUP BY	NONE	Get into on a class of elements
INSERT	LOAD	Add data to table
INSERT (w/ GRANT/REVOKE)	MPW	Control adding of row data to table
LIST ACCESS	NONE	Display current access permission for all users
ORDER BY	SORTED BY	Specify order of rows displayed
PUBLIC	NONE	Allow all users access to table or view
REVOKE	RENAME MPW/RPW	Remove access privileges
SELECT	SELECT	Display row data from table
SELECT (w/ GRANT/REVOKE)	RPW	Control viewing of row

CHANGE

MPW

data from table

data in table

Change value of columns

Control changing of column

MS-DOS Encyclopedia: One-Stop Reference to Every DOS Version

BOOK REVIEW

BY ROBERT HUMMEL AND GUS VENDITTO

DOS, in all its incarnations, can lay claim to being the most widely used software on the planet. Not content with that, Microsoft wants to make DOS the most heavily documented niece of code as well

To that end, Microsoft's publishing wing, Microsoft Press, set off 2 years ago on a project requiring 20 man-years worth of effort from 14 writers 53 editors, and 65 advisors. leading to The MS-DOS Encyclopedia, a 6.73-pound, 1.570page compendium of everything Microsoft and its advisers could think of saying about the Disk Operating System.

The Encyclopedia starts with a fascinating introduction that traces the history of DOS, starting with Bill Gates' and Paul



Allen's first programming for the MITS Altair, and detailing the steps that led to PC-DOS. Don't confuse this edition

with Microsoft's abortive first effort at producing a comprehensive DOS reference in 1986, which was so error-ridden it had to be recalled and abandoned. This work is authoritative and accurate in its gathering of DOS system calls, command syntaxes, and various minutiae. like the file control block structure. .EXE file beader formats. and instruction sets for the 8088, 286, and 386.

Those who have read IBM's

DOS manual will find the explanations of DOS commands and options much improved. The Encyclopedia's alphabetical syntax listing notes the commands, switches, and options that were introduced with one

It's insightful in a number of chapters, where legends like Ray Duncan, Charles Petzold, and Van Wolverton shed light on side topics like "Structure of an Application Program" and



From the historical introduction to the encyclopedia, a retrint of an early Microsoft outline of the steps that are required to get DOS running on the PC. Copyright 1987 by Microsoft Press; reprinted with permission.

FACT

The MS-DOS Encyclopedia Microsoft Press 16011 NE 36th Way Box 97017 Redmond, WA 98073 (206) 882-8080 List Price: \$134 95 disk

ISBN: 1-55615-049-0 In Short: All that you want to know about DOS in one place. CIRCLE 454 ON READER SERVICE CARD

"Writing MS-DOS Filters." This massive book is not just a dry reference. To illustrate the nuts and bolts of DOS programming, page after page of program listings are included. Examples of device drivers and interrupt handlers are provided in C and assembly code, sprinkled liberally with comments. And Microsoft doesn't pass up this chance to steer your attention toward the Windows environment, with a chapter devoted to its structure and the techniques needed to write for it. Most of the code is available on disk for an extra charge.

Experienced DOS programers, who may already own the DOS Technical Reference manual and some of the better reference works (Ray Duncan's Advanced MS-DOS: Peter Norton's Programmer's Guide to the IBM PC), may find the book unnecessary. It will prove unwieldy as a desk reference, and it doesn't offer much new material. A thorough reading will turn up a few elusive tidbits about disk partitions and DOS structures, for example, but it will take a lot of effort.

Microsoft Press seriously blundered by printing the code listings in light-blue ink. The contrast is so low that after a few hours of reading, even the sharpest eyes will have difficulty following the code.

If you like the idea of a onestop DOS reference book, then this book is for you. But if you've already got a full DOS library, this work will seem re dundant.

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Revving Up the 286 Processor: New ATs Run from 6 to 16 MHz

HANDS ON

BY JONATHAN MATZKIN AT-class machines-PCs built around a 286 processor and of-

fering both 8- and 16-bit expansion slots-slip a few notches further from the state of the art every time a new 386 PC is released. As they slip, they become more of a bargain for offices in which low prices and faster-performing ATs are a top priority.

New machines from Leading Edge Hardware Products. Dell Computer Corp., and Wells American represent the range of choices available. The Leading Edge Model D2 builds on the success of the original. 8088-based Model D. while the PC's Limited System 200 is Dell Computer Corp. 's effort to correct some of the limitations in its earlier 286s. The Wells American A*Star 16-MHz 286 is blindingly fast but is limited

in its hardware compatibility. The Model D2 is the successor to Leading Edge's Model D. one of the first clones that could seriously be called compatible. The D2's \$1,495 price tag includes a 1.2MB floppy disk drive, an EGA/CGA/Hercules/MDA-compatible graphics eard, and a monochrome monitor. The base price also buys you 640K of RAM, a 200-watt power supply, and one serial

and one parallel port The D2 also comes with one of the best keyboards to be found on a non-IBM machine The keys have a "elicky" tactile response that is considerably more comfortable than the usual mushy clone keyboard.

Adding a 30MB hard disk boosts the system price to \$1,995, while a 65MB system

will set you back \$2,495 The small-footprint PC is narrower and deeper than a standard AT. It has four 16-bit and two 8-bit slots

At 10 MHz, the Model D2 ran about even with the PS/2 Model 60 in our benchmark tests. The system can run at 6, 8, and 10 MHz.

The D2 isn't a world-beating performer, but it offers solid AT power and a complete configuration at a very attractive price. Dell Computer's PC's Limited System 200 replaces the company's 8- and 12-MHz offerings. The company has over-

hauled the look of the system

lized clone world by dropping its proprietary BIOS The Phoenix BIOS found in its place offers support for 31/2-

inch floppy disk drives-the lack of which was a key failing in earlier PC's Limited 286s. The System 200 runs at se-

and many of its internal compo-

indicator panel is gone from the

front of the machine, and Dell

has joined the rest of the civi-

nents. The LED "Smartyue"

lected speeds of 12.5 and 6.25 MHz. The I/O bus runs at speeds of 8.3 and 6.25 MHz. to avoid hardware-compatibility problems at the higher clock speed.

The System 200 will run a version of OS/2 that will be available from Dell. Running at 12.5 MHz, the System 200 solidly outperforms the PS/2 Mod-

el 60 in our benchmark tests. A basic monochrome system sells for \$1,799. That includes 640K RAM, a 20MB hard disk. two serial and parallel ports,

and a 200-watt power supply. The Wells American 16-MHz A*Star is the fastest AT compatible you are likely to see. It's the fastest of the three ma

chines benchmark-

and leaves the PS/2 Model 60 in

the dust

Unfortunately, the A*Star's I/O bus runs at processor speed. and since many existing add-in eards for the AT bus won't run properly at speeds above 10 MHz, hardware conflicts are a problem. So you may have to replace or omit some of your hardware to take full advantage

of the system's speed. A basic 16-MHz configuration, with a 1.2MB floppy disk drive, a 21MB hard disk, and a mcg of RAM, costs \$2,195. A

220-watt power supply is standard List Price: Leading Edge Model D2. \$1,495. Leading Edge Hardware Products Inc., 225

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List Price: PC's Limited System 200, \$1,799, Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759: (512) 338-4400 CIRCLE 454 ON READER SERVICE CARD

List Price: Wells American A*Star 16-MHz 286, \$2,195. Monitor additional. Wells American, 3243 Sunset Blvd., West Columbia, SC 29169-(803) 796-7800

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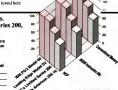
Benchmark Tests: IBM PS/2 Model 60 vs. Wells American 286 16, PC's Limited Series 200, and Leading Edge Model D2

he speeds at which these machines ran their 286 processors were responsible for the performance differences on these tests. Higher clock speeds did cause some compatibility problems in machines in which the expansion ran above 10 MHz.

Performance Times (Times given in seconds) NOP IBM PS/2 Model 60 3.36 1 04 Leading Edge Model D2 3.35 7.09 PC's Limited Series 200 2.69 5.60 0.83 Wells American 286 16 2.09 4.29 0.61

The NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing ors and the effect of me This test executes almost nothing but NOF ration") machine code instructions in a big

the time it takes to execute a selected series of essor-intensive tasks. The test program uses 80 instruction code. These instructions are a subse



Relative Times

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PIPELINE

Top Ten Sellers That a difference an an- [came, and dBASE sales bounced nouncement makes. Lotus 1-2-3 2.01 right back, thanks to the promise Lotus Development Corp. Last issue, dBASE III Plus had of a nominal upgrade cost for new purchases. Now Ashtondropped out of the Top Ten Sellers, probably because of a wait-Tate can calmly work on J.K. Lasser's Your Income Tax 1988 on & Schuster Software and-see attitude that resulted finishing dBASE IV (see Prefrom speculation that Ashtonview on page 33), and users can TurboTsx Personal/1040-1987 ChipSoft Inc. Tate would soon announce plan on benefiting from better the next version. Well. report writing, applications the announcement generating, and compiling. So everyone's happy, except for PFS:First Choice 2.0. Software Publishing Corp. the burned souls who put their money down just before the February 17 cutoff and have to dBASE III Plus 1.1 upgrade for \$175 instead of \$30. ton-Tate Com IBM Breaks the Ice WordPerfect Corp. Cynical IBM watchers may be quick to discount PFS:First Publishe the impact of the Software Publishing Corp. IN PERSPECTIVE **PC Tools Deluxe** The Top Ten Sellers list ranks PC Central Point Software business programs according to their sales performance in the last week of a 5week period based on unit sales. It also tracks programs' rankings over time, in this issue (reading left to right) from January 18 through February 19. A 5-week history is charted to give a sense of a program's sales strength over time. Dramatic shifts in a particular program's ranking may be the result of sales promotions conducted by individual retailers. Or seasonal factors, such as end-of-year-budget purchase decisions, may play a large role in the performance of a particular program in any period. More than 12,000 indi-Rankings are based on net sales by unit; returns are sub-tracted from gross vidual locations contribute to the list. Sales information compiled by Ingram Software Inc. SURVEY Cost aside, which would you most like to add to your PC? We called this survey "Dreams vs. Reality." We wanted to see how much the cost of hardware was holding people back from satisfying their wildest desires. Not much, as it turns out. Generally, people plan to buy that better hard disk or VGA board. Some respondents couldn't play along, "I am unable to separate cost from CD nitreer

reorganization that recently swept through IBM, but from where we sit there are indications that a sense of openness and market responsi veness may yet creep into IBM's philoso-

Glasnost will not come easily to IBM, but the blue troops have been struggling mightily to map out their near-term strategy without giving away all of their secrets.

At PCMagazine, we usually pass on the speculation in favor of pounding on the hardware, but some of the news trickling out about events surrounding the changes in IBM's infrastructure holds great promise for hardware fans.

So far, IBM has said that the 8088 and 8086 will have no further life in the PS/2 line. New entries will be based on Intel⁵. 16- and 32-bit processors, and by the end of 1989, the entire line will be built around 386s, No more old-bus machines will be built; the Micro Channel will reign suprema.

Because IBM will be throwing its full weight behind OS/2, a few other changes must be made to its PS/2 line. For example, the Model 50 will need to be bolstered in order to run OS/ 2. Version 1.1 (with the Presen-

value. 'Money aside' is nonsense,' said one. Others accused us of thinking too small: 'Geeezz! 'Cost aside' means a Cray, guys. Think big!' If our responses are any indication of consumer interest, it's no wonder that color printing still lags behind other output devices: only 2 percent chose it.

WAITING IN THE WINGS

Laser printers waste far less paper than dot matrix printers, but they still have an inherent waste factor built in: only one side is used.

Technology that's now nearing completion will soon overcome that limitation. Canon is putting the finishing touches on a paper-handling mechanism that will smoothly move sheets through the laser engine for printing on both sides. Since the first generation of this technology will use the same 8-page-per-minute printers mov common, speed is likely to suffer from the increased

paper-handling overhead.

This duplex engine will most likely make its way into printers from a wide variety of manufacturers, much the way Canon and Ricoh now supply the print engine for virtually every laser or inter now sold for PCs.

virtually every user printer now soil for PCs.

The first machines are likely to appear this summer.

If you're waiting for a color laser printer, settle in for a long wait. Massive hurdles still need to be overcome before a PC laser printer can be sold for less than, say, \$30,000.

tation Manager), at acceptable levels (the Extended Edition can easily chew up 20MB of disk space before the first application is run). So the Model 50 will be sold with a larger and faster hard disk and more memory (4MB of RAM is the minimum 05/2.1 L will require). To speed

thingsup, the new Model 50 will

Following the success of

run without wait states.

3Com and others, IBM will introduce a diskless version of the Model 50 for networks. Other changes we'll see

within a year are PS/2s that incorporate the hi-res 8514A graphics controller on the system board and a 12-MHz graph-

ics coprocessor for faster windowing. 1BM's plans for OS/2 include a System 36 version and a target of 1,000 OS/2 programs running by early next year. Last time we counted, there was only one OS/2 application actually being sold (ThinkTank from Symantec), with many more promised (a few of them behind schedule).

To help get the ball rolling, IBM will soon release Display-Write for OS/2.

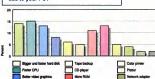
(If you have ever wondered why IBM software for the PC never made it big, here's one clue. A New York company, Wertheim & Associates, is self-ing Hewlett-Packard Laserlet Series II drivers for Display-Writee'. The cost? A mere \$500. We don't know if the new DisplayWrite will concecle that people do actually connect PCs to printers that are not made by IBM, but we wouldn't beton ji.) IBM, but we wouldn't beton ji.)

IBM also confirmed that an enhancement to DOS with pulldown menus is in the works (see First Looks, page 56, "Microsoft: Widespread Acceptance of OS/2 Is Still Many Years Away," PC Magazine, March 15, 1988).

April announcements have become something of atradition with IBM, so you should be hearing firm details on the above in a matter of weeks.

—Gus Venditto

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4Views Plugs a Slew of DBMS Functions into Your Worksheets



HANDS ON

BY MERV ADRIAN Turner Hall Publishing has weighed in with what must be the sixth 1-2-3 database add-in. 4Views lets you use your 1-2-3 database with Table. Forms. Crosstab and Report Views leaving the data in the 1-2-3 file

while doing its work. Table View presents an attractive appearance, with "field names" at the top, and lines between the columns. You can add, delete, and change records. Analytical query tools in Lotus menu fashion are provided. While the query function isn't as striking as the 'database outlining" in Computer Associates' Silverado, it permits field computations, filtering, sorting, and direct record retrieval by key.

4Views expressions are compatible with 1-2-3 syntax, including intelligent use of function keys. Report Views and Crosstab Views permit other levels of analysis, sorting and summarizing one variable by another. Nine (a functions and eight @ PRINT functions facilitate using 4Views within 1-2-3

saved in files with the extension 4VW

The name of the View itself doesn't appear anywhere on the screen, a serious omission, especially if you have multiple Views in a given application.



In 4Views' Xtab function, the Analysis Field tells 4Views which field to summ the Analysis Operator and Divisor determine the way daso will be summorized.



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In Short: An add-in reporting and analysis product for 1-2-3 data. Not copy protected. CIRCLE 432 ON READER SERVICE CARE

Files may be joined relationally on common fields. After the JOIN has been done you may delete fields from the View, including the fields on which the JOIN is based!

The manual is the biggest failing. The mostly excellent tutorial comes after seven chapters and is completely impenetrable on the subject of report customization. A new manual will be distributed free to registered users in May.

Graphics Utility Performs Gray-Scale Conversions



HANDS ON

BY TOM STANTON Preproduction in desktop publishing remains a haphazard affair. Previewing .PCX files with PC Paintbrush takes time. and you can't view the entire image. Screen capture may be common, but converting color to gray scales automatically is not. Text previewing could also be improved: most utilities are limited to screen-by-screen paging and 25 lines in EGA text

Collage, an assortment of utilities from Inter Media, comes close to answering these preproduction needs.

SHOW lets you load and view .PCX files in color or black and white without running a paint or publishing application. SHOW accepts wildcards so you can review large groups

of files screen-by-screen. There's also a zoom mode that doubles resolution, based on the file size, for examining detail. The file header identifies the file name and path so you know what you're viewing, SHOW should be standard issue with every desktop publishing pack-

SMOOTH lets you view text by scrolling smoothly, rather than screen-by-screen, and includes a search string facility and a 7/8 bit toggle for high-order bits

age on the market.

SNAP, a memory-resident screen capture program, uses 24K RAM and is called up using Shift-PrtSe. Its menu has print screen, screen save, screen palette, and a calendar.

Using arrow keys, you can change colors in any application before saving the screen. SNAP will leave the application in the colors you select if you exit

without resetting, so you can try different screens in the selected

SNAP's Gray Scale .PCX mode saves in black and white, converting colors to gray scales; there's also an Inverse Gray .PCX format. The gray scales use 2-bit arrays, so there are only five gray levels possible. Images with large areas of similar color tend to blend together and lose gradation, so SNAP may have limited use on some color graphics. I found I could improve some screens using the

palette utility to increase color

contrasts, but even here there

are only so many choices. One

side benefit of the five gray

scales is that SNAP files are much smaller than the average .PCX file and load faster in Ventura Publisher and PageMaker. Collage utilities are easy to use and well documented. They provide a good set of no-non-

sense tools for publishing. Enhanced gray scaling in SNAP would be useful, but otherwise it holds up well against its com-



Collage Inter Media Inc 60 Plain Rd Hollis NH 03049 (603) 465-3216 List Price: \$89.95 Regulres: 256K RAM; onc disk drive: EGA or VGA graphics; DOS 2.0 or later In Short: A suite of tools that includes screen capture in color or with automatic gray scaling in .PCX format. Not copy pro-

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PC MAGAZINE . APRIL 26, 1988

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\$100 Sourcer Produces Order out of Chaos: Disassembles, Documents Machine Code



BY ROBERT L. HUMMEL Sourcer, from V Communications, creates documented assembly language source code and listings directly from either memory or from DOS program files with ease and intelligence. Not just a tool for assembly programmers, Sourcer doesn't require that you have a degree in

computer science to operate it.

In fact, you can turn out read-

able source code for almost any

program without knowing a

thing about assembly language

Already destined to become a classic in the programming community, Sourcer offers significant benefits to many classes of users. For example, it can be used to clarify undocumented code or create source code when the original has been lost or is unavailable. A program suspected of being a "Trojan horse" or of containing a "vi-

rus" can be disassembled and examined at the source code level for suspicious routines. Simply put, an assembler (like MASM) translates humanreadable assembly language instructions and data (assembly



You can set Sourcer's analysis ontons-number of passes, remark printing, listing of segments-from the single-screen control center

making recreation of source code possible.

But as anyone who has ever looked at a program with DE-BUG can tell you, assembly language programs can be horribly complex, containing mixed code and data, which makes a simple disassembly virtually impossible. Sourcer overcomes this problem using the same method that a programmer might: by tracing through the execution of the target program and watching what it does. As more information about the program is collected, the analysis becomes more refined. The tar-

accessed, I/O port activity, and some of the more-complex assembly instructions, as well as identifying most BIOS and DOS function calls by name. Be aware, however, that while all these comments help you see what the program is doing, they don't tell you why. Analysis of that sort is still in the human domain. Sourcer's biggest benefit is that it performs the initial, mostly mechanical analysis of a program for you. On a large program, this savings can add

extra information on data areas

up to days or even weeks of programming time. Once the initial Sourcer run is completed, programmer in-

sight can be added via a definition file that allows the disassembly process to be refined. comments added, data structures specified, and locations and variables named. The definition file syntax used in the version of Sourcer that I tested

(1.6) was unnecessarily complex. But a new version of the program, currently in beta testing, that will allow more powerful and greatly simplified syntax should be available by the time you read this

Sourcer can disassemble the DOS . COM and . EXE program file formats, overlays, device drivers, and other binary file types. Many of these file types are recognized automatically.

Processor instruction sets sup ported include 8086/87/88. 80186/188, 80286/287, and V20/30. The protected-mode 80286 instructions are also fair game, allowing disassembly of OS/2 programs.

In addition, with the purchase of the optional BIOS Pre-Processor, complete, commented source code listings of the BIOS for almost any IBM-compatible computer can be generated. Because the entry points and functions of many portions of the BIOS are known, these are identified on the listing automatically. Hackers should note that since IBM is no longer supplying a BIOS listing for their PS/2 computers, this may be the only way to get one. Note, however, that in the current version. the instructions unique to the 80386/387 processors are not

If you've ever had to examine undocumented assembly code or were curious as to how a program worked, then Sourcer is a must. Now that I've tried it, Sourcer is up there on my list of programs that I simply won't do without. The technical support is great, and with a 30-day, money-back guarantee, you can't go wrong.

FACT

V Communications 303 I Tisch Way, #200

San Jose, CA 95128 (408) 296-4224 List Price: \$99.95; BIOS Pre-Processor, \$49.99; both, \$130.00

Requires: 320K RAM, DOS 2 O or later

In Short: A disassembler that generates commented source code. Outstanding features and power with programmability. CIRCLE 431 ON READER SERVICE CAP

A program suspected of being a "Trojan horse" or of containing a "virus" can be disassembled and examined at the source code level for suspicious routines.

code) into their compact, machine-executable equivalents (machine code). Conversely, a disassembler performs the opposite service: translating machine code back into assembly code. Unlike BASIC or Pascal, in which a single instruction can generate many lines of machine code, assembly language enjoys a 1:1 correspondence between the source code instructions and the resultant machine code.

get program may be examined by Sourcer's execution simulator up to five times in a single run. Each simulation provides a better picture of the actual program operation

Undocumented assembly code can be ervotic and unreadable. This isn't a problem with Sourcer. In addition to producing the assembly code, Sourcer actually adds comments to the listings! The comments include FINISH FINANCIAL WORK FIVE TIMES FASTER.



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remember your bills, print your checks, and update all records automatically. All you do is sign the checks.

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Here's what the critics say "I've never seen such an easy-to-use

manual or software that's so simple to use? Martin Blumenthal, inCider Magazine

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Esther Dyson, Industry Analyst

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compatibles with 256K RAM and IXOS 20 or higher, All

printers: All memorisors. Also available for Apple* IIe, IIe

and G5 with most of the same features. Capacity: Number of bank accounts Number of transactions, unlimited, Maximum amounts \$9,999,999 99. Number of income/expense categories 250 with 256K, thousands with 512K RAM.

Others Not copy protected. Checks are approved for all



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Harvard Graphics 2.1 Packs More Features

Supply Costs

monthly payments to Alaskan distributors

HANDS ON

BY ROBBIN JURIS If there was one business graphics task that Harvard Graphics, Version 2.0, couldn't do, you would have been hard-pressed to find it. But the mechanics of chart preparation aside, Version 2.0 couldn't correct a problem that can undermine even the most well-thought-out presenta-

tion: typing and spelling errors.
With Version 2.1, Software Publishing Corp. has gone a long way toward solving this problem by adding a 77,000word spelling checker. The vocabulary of this spelling checker is more extensive than those you'll find in many word processors, although it doesn't come close to the current leaders. Like most word processors. Harvard Graphics lets you create a personal dictionary of specialized words.

But that new feature is only one of Version 2.1's enhancements. Software Publishing has added 200 more symbols to the package's clip-art library.

Version 2.1 also lets you I save charts as symbols, which means that you can alter the size, shape, and individual attributes of a chart; move legends, labels, and pie slices; and situate your chart anywhere on the screen in the same way you would a symbol. A data table feature lets you include in tabular format y-axis data values for

a given x-axis point in a bar,

size of the x-axis and y-axis labels in your charts, a new feature lets you do that as well. This upgrade adds support for General Parametrics's Vi-

deoShow, for producing slide shows and screen shows; Kurta's IS/ONE Tablet, for modifying images; and three laser printers-IBM's Pageprinter and NEC's LC-860 and LC-890. line, area, or high/low/close You can export charts and sym-

bols to such desktop publishing programs as PC PageMaker, Ventura Publisher, or any program that can read encapsulated PostScript (EPS) files.



Harvard Granhics Version 2.1

Software Publishing Corp. 1901 Landings Dr. Mountain View, CA 94039-

(415) 962-8910 List Price: \$495; upgrade from Harvard Graphics, Version 2.0, \$50; upgrade from Har-

vard Presentation Graphics, Version 1.0, \$150 Requires: 512K RAM, two disk drives. DOS 2.0 or later

In Short: One of the best dedicated charting packages gains a spelling checker, more symbols, and other useful features. Not copy protected. CIRCLE 452 ON READER SERVICE CAR



HANDS ON

BY MITT JONES For all the talk about PostScript, you'd think a PostScript printer was some gee-whiz gizmo with gold cogs that has to be christened with Dom Perignon as it

leaves the factory

QMS's JetScript PostScript Controller, distributed by The Laser Connection, reminds us that all it takes to print Post-Script is a laser printer, a Post-Script interpreter with a dedicated processor, and lots of RAM. If you've got an HP LaserJet series II. JetScript adds the other necessities

The Motorola 68000 processor and 3MB RAM come on a full-length board that installs in your XT or AT. A small adapter card installs into the LaserJet's slot to receive the PostScript signals from your system.

The man of Alaska is one of Harvard Graphics's new symbols

JetScript includes Adobe's PostScript interpreter (Version 47.2) and the same 35 fonts Apple ships with its LaserWriter Plus and LaserWriter II. Once it's up and running, you can use your LaserJet series II either as a PCL printer-as you normally would-or as one of the fastest

PostScript printers around. JetScript, coupled with a LaserJet series II, is the fastest PostScript printer we've tested. JetScript and Apple's Laser-Writer II NT depend on a Motorola 68000 processor to handle the PostScript interpreter. but each runs the processor at a different speed and transfers

data at a different rate.

Apple's II NT runs at 12

MHz and zero wait states, fast in comparison with the old LaserWriter Plus. But JetScript runs at 16 MHz with one wait state and drastically improves the data transfer rate by staying away from the 9,600-bps COM port in favor of its own highspeed video transfer.

The two printers finished our simple, single-font benchmark tests nose to nose, with both clocking in at 7.4 pages per minute. But in a real-world PostScript test-printing a fourpage PageMaker document scattered with images and graphics on an 8-MHz IBM PC AT-JetScript flexed its muscles. JetScript printed the file in 6 minutes 43 seconds initially and 4 minutes 33 seconds once the fonts were loaded into the

cache: the LaserWriter II NT

The JetScript PostScript

The Laser Connection P.O. Box 850296 Mobile, AL 36685 (205) 633-7223 List Price: \$2.495 Requires: HP Laserlet

series II. In Short: A full-length adapter that transforms an HP LaserJet series II into a PostScript-capable printer.

CIDCLE ART ON READER SERVICE CARD

performed the same test in 9

minutes 18 seconds and 6 minutes 39 seconds, respectively. All in all. JetScript is the answer to your problem if you need PostScript but already own a Laser let series II.



When you need to move quickly among programs and files, Software Carousel carries the load for you.

Why get dragged down by that old PC technology?

Despite the sophistication of today's PCs, there's one thing they still don't do. And that's work the way people work. lumping from one task to another - from budgets to memos to phone calls and back.

So every time you need to change programs-or just look at another file-it's the same old, tiresome routine - saving. exiting, ksading, retrieving. Not very convenient. Not very human. Now you could wait for the "next generation" of computers. Or use Software Carousel, and get the speed and convenience you need today, with the software, and computer, you already own. Here's how to make Software Carousel work for you.

Software Carousel is the amazingly easy way to switch almost instantly from Word-Perfect to I-2-3 to dBASE to DOS to whatever else you want. Or go from one file to another in the same program. All without saving or retrieving - or wasting a precious moment of your time. Or your computer's memory.

It works by creating a number of independent software slots to load your programs into. You get up to ten of these software

slots, so you can load up to ten programs. Need to crunch numbers? Hit a key and there's your spreadsheet. Need your word processor? Don't bother saving your spreadsheet file. Just whip over to your document and do your work. Snap back to your spreadsheet and it's just like you left it. It's like all your programs are "pop-ups," just a hotkey

Or load the same program into a few different slots, each with a different file. Now go from one to another in an instant.

Here's the best part of all. You may have heard about some other "environment" programs that claim to do something similar to Software Carousel. But there are several important differences. First, they make you split your memory

up among the programs you want to use. Software Carousel lets you use all available memory in each and every program. It even supports expanded and extended memory. Other environment programs work with only some software. Software Carousel

works with everything. Period. It even resolves conflicts among memory resident programs.

Other software creates a working environment that's complex, unfamiliar, with cramped little windows and strange commands. Software Carousel takes minutes to

set-up just the way you want it. All your software looks and acts exactly as it always did. It's so downright useful, even IBM" recommends it Even as you read this page, there are tens of thousands of Software Carousel users zip-

ping through their work without laborious and repetitive commands. And without the usual 640K limit imposed by DOS. In fact, even IBM recommends Software Carousel for use with their most popular mainframeto-PC communications rackage.

We think you'll agree, that with this kind of speed, convenience, and nextgeneration performance, \$79.95 is a small price to pay. Look for Software Carousel at software

lealers everywhere. Or order direct from SoftLogic Solutions by calling us toll-free lf, after thirty days, you're not satisfied that Software Carousel is the right way to get that old PC technology off your back, we'll gladly arrange for a refund of your purchase price.

Here's what people are saying about Software Carousel: "Can't believe how well it works. Who needs 80386?"

-Rath Evans, Assorney, Fallerson, CA

"Unlike other attempts (e.g. MS Windows, DesqView) yours works, is not fragile and does not intrude its "personality" on everything that we do."

-Cala Raph, Raph & Pareer, Inc., Santle, WA

"Fantastic program, Great book, Saves me an hour a day! Thanks," -Larry Pearsal, Rolling Hills Covenant Church, Rolling Hills Estates, CA "Solved all my problems with resident software." -Walter Affouritt, West Islip, NY

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Sonbco Touts Force III As the Fastest dBASE Compiler Available

Sopheo Inc., of Boulder, Colorado, claims its Force III is twice as fast as its nearest competitor among the currently available dBASE compilers.

It also claims greater compatibility with dBASE III Plus. and says that its compiled .EXE files are a tenth the size of those of other compilers. This is because the compiler includes only needed subroutines, and those are in very compact assembler.

The compiler allows for 2.1

billion records per database, 2,048 fields per record, and as many arrays as memory can

support. Other features you get with Force III are I/O directives, trig and string functions, sound, for .. next loops, extended data types, user-defined functions, and the ability to link to lan-

guages that produce .OBJ files. List Price: Force III. \$129. Requires: 256K RAM one disk drive, DOS 2.0 or later. Not copy protected. Sophco Inc., P.O. Box 7430, Boulder, CO 80306; (303)

444-1542 CIRCLE 442 ON READER SERVICE CARD

place a template on the tablet

and use it for immediate menu

selection, rather than going

comes with both a tip-click sty-

lus and a four-button cursor, lt

plugs into a serial port and works with CADD and drawing

software supporting the bit pad

Regulres: RS-232 serial port, bit

nmagraphics, 777 State St

Extension, Fairfield, CT 06430;

pad-standard software.

(203) 384-1344.

standard List Price: Bit Pad Plus. \$495.

Priced at \$495, the tablet

through a menu hierarchy.

\$995 Expo Adds the Time Dimension to Your Numbers with Graph Spreadsheets

Leading Market Technologles, of Cambridge, Massachusetts, has developed Expo. a program that displays a spreadsheet of graphs, letting you see your data as trends over time instead of lists of numbers

The \$995 program has Notebooks" that contain groups of related data and spreadsheet parameter files. After opening a notebook, you can add blank cells into which you can pull data or draw graphs based on formulas. Each note-

book holds 64 graph cells. Data can be imported from traditional spreadsheets, databases, or any ASCII source.

Sq., #2200, Cambridge, MA You can designate formula cells to perform arithmetic, statistical, trigonometric, and cal-

culus functions on other cells There are macro and command file capabilities to automate operation. Expo functions can zoom, scroll, expand, and overlay the plots. A cross-hair cursor lets you pinpoint numbers on the charts.

There is a pipeline in Expo that allows you to run another program without leaving your session, and context-sensitive help is provided.

List Price: Expo, \$995. Requires: 512K RAM, Iwo disk drives, graphics adapter, DOS 3.0 or later. Not copy protected. Leading Market Technologies, One Kendall

01239; (617) 494-4747.



Leading Market Technologies' \$995 Expo performs spreadsheet-like functions on cells containing graphs to add the time dimension to data

Summagraphics Makes Bit Pad Plus, \$495 Electrostatic Tablet for CADD, Graphics

Summagraphics Corp., of Pairfield, Connecticut, set a standard for tablet graphics input devices with its Summa-Sketch. Bit Pad Plus, its latest tablet, uses capacitive electrostatic charge ratio technology instead of the electromagnetic technology of the Summa-

The tablet's input location is absolute-clicking a certain spot on the tablet will always affect the same area on the screen. You don't position the cursor by pushing and lifting the stylus over the same area, as you do

with a mouse. This property means you can



ogy so pointer distance doesn't change cursor position.

Two Word Processors Integrate Graphics and Link by Using Hypertext

Hypertext is the salient feature in Black Magic, according to NTERGAID, a new firm based in Bridgeport, Connecticut. Black Magic's hypertext lets you link documents with notes. references, replacements, and other documents.

The \$150 program can also integrate graphics with text with a screen-grabbing utility, display screen graphics fonts, use macros, and overlay windows. NTERGAID has released public-domain programs in CGA, EGA, and Hercules graphics modes that allows others to read complex hypertext

Lifetree Software, developer of Volkswriter, has announced Total Word, Lifetree says the \$495 word processor brings you personal publishing with its support of Hewlett-Packard or PostScript laser printers and their fonts. The

(continues on page 52)

NEW ON THE MARKET

Word Processors

ability to integrate graphics also adds to this claim.

Also featured are a 300,000word thesaurus, a 170,000word dictionary, alternate keyboard layouts for 250 scientific and technical symbols, predefinable style sheets, and page preview.

List Price: Black Magic, \$150.

Requires: 192K RAM, two disk drives, EGA adapter, DOS 2.0 or later. Not copy protected.

NTERGAID, 955 Connecticut

Ave., Bridgeport, CT 06607; (203) 368-0632.

CRCLE 430 ON READER SERVICE CARD
List Price: Total Word, \$495.
Requires: 480K RAM; one floppy
and one hard disk drive or two 31/inch drives; DOS 2.0 or later. Not
copy protected. Lifetiree Software
lnc., 411 Pacific St., Moniterry, CA
93940; (800) \$43-3873; (800) 831873316; Calife.

8733 (in Calif.). CIRCLE 439 ON READER SERVICE CARD



The Arche Rival 386 Packs a 20-MHz PC Into Space-Saving Box

Perhaps wishing to be known as the fast-food chain of computers, or to someday have signs reading "over 10 billion sold," Arche Technologies' goldenarch logo resembles that of Mc-Donald's, and its compatibles aim for sneed.

aim for speed.

"Fast" is the appropriate
word when talking about 20MHz machines. The Arche Rival 386 offers that speed in a

MHz machines. The Arche Rival 386 offers that speed in a

3-2-1 Blastoff Uses Numeric Coprocessing to Speed Up Recalcs

Frontline Systems has produced a spreadsheet compiler and add-in for Lotus 1-2-3 that speeds up recalculation by actor of from 2 to 15, depending on spreadsheet complexity.

Part of the speed comes from minimal recalculation techniques, but 3-2-1 Blasseff improves calculation officiency by translating 1-2-3 cell formulas into machine code. The compiled spreadsheets run only inside 1-2-3 and come ballered, although changes to existing formulas will show down performance, since the alterned formula will show down performance, since the alterned formulas will show the interpreted by 1-2-3 rather than the compiled 3-2-1 Blasseff worksheet.

Spreadsheets compiled with 3-2-1 also have one-half to onethird the memory requirement of the same uncompiled spreadsheet. All 1-2-3 functions are usable in the compiled version, unless you choose 3-2-1's secure spreadsheet option, which hides all formulas.

Compilation time is fast, too: Frontline says that compiling a spreadsheet takes only slightly longer than it takes 1-2-3 to load the same spreadsheet into memory.

List Price: 3-2-1 Blassoff, \$124.95. Requires: 384K RAM; one disk drive; 8087, 80287, or 80387 msth coprocessor; Lotus 1-2-3, Release 2; DOS 2.0 or later. Not copy protected. Frontline Systems, P.O. Box 7408-Pt, San Francisco, CA 94120; (800) 451-

0303, ext. 55; (916) 677-7171. CIRCLE 436 ON READER SERVICE CAR The Arche Rival 386 offers 20-MHz speed in a small-footprint system box.

61/4- by 171/4- by 161/4-inch box. Standard features include a 14-inch, 1,000-line flat-screen monitor, a high density 51/4-inch disk drive, 2MB of memory expandable to 16MB, and zeropandable to 16MB.

wait-state interleaved
memory, a 101key keyboard,
two parallel
ports and two serial
ports, eight expansion slots
(two 4-bit, four 16-bit, and two
22-bit), a Hercules-compatible
board, a 5¼- and 3¼-inch disk
controller board, and a 200- watt

switchable power supply (110'220 V; 50'60 Hz). Options include 40, 65, 80, and 140MB fixed disks and an EGA monitor.

Arche is bundling MS-DOS 3.3 and GW-BASIC with the 10/20-MHz switchable machine.

List Price: Arche Rival 386 (single-drive monochrome system), 43,395; 400B hard disk system, 54,995; 65MB system, 55,795; EGA system, 5500 extra. Arche Technologies tnc., 745 High St., Westwood, MA 02090; (800) 422-4674; (617) 461-1111.

CIRCLE 440 ON READER SERVICE CARD

300-dpi CAT Scanner Attaches to Printhead Of a Dot-Matrix Printer

Computer Aided Technology makes the CAT Scanner, which snaps into an Epson- or Panasonic-standard dot matrix printer and converts what it sees into .PCX, TIFF, or .PFF files.

The CAT Scanner has resolutions up to 300 dots per inch horizontal and 216 dpi vertical, and 128 gray levels with software-selectable contrast. There are two scan modes: line and halftone. The former is suited to technical drawings, while the latter is best for photos.

The maximum scan area is 6 by 36 inches on a narrow-carriage printer and 12 by 36 on a wide-carriage machine. The unidirectional scanner

comes with a half-length interface board and software that less you zoom and scale images. Lalk Priesc AT. Scanner (with adapter card), 5195. Requires: 512K RAM, on Balf-length hus slot: EOA, CGA, or Hercules graphics adapter, Panssonic KX. P1080, 1091, or 1092, or Epoon MX, RX, FX, LX, EX, or LQ series printer; DOS 2.1 or later. Computer Aided Technology Ber., 7411 Hinss PI, #212, Dalas, TX 7933: 7218-715.

CIRCLE 443 ON READER SERVICE CARD

\$1,999 Minuteman Delivers 15 Minutes of 1,600W Backup Power

Para Systems is offering a power supply unit that gives you 15 minutes of 1,600-watt backup time and protection against brownouts, surges, spikes, and FMI/RFI interference.

The \$1,999 Minuteman MM1600SS/I accepts current at 117 volts and delivers 117 V plus or minus 5 percent in a synchronized sine wave when activated by under- or overvoltage. Transfer to backup power occurs in 1 millisecond.

List Price: Minuteman MM1600SS/1, 51,999 Para Systems tnc., P.O. Box 815188, Dollais. TX/78318-1888: 6800 2384

CIRCLE 441 ON READER SERVICE CARD

7272. (214) 446-7363.





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CIRCLE 472 ON READER SERVICE CARD

OUICK LOOKS

Dialing into Daily Weather Forecasts

HANDS ON

BY GUS VENDITTO You may not need a weather man to know which way the wind blows, but what about wind speed? Your radio station can give you the temperature and the chance of rain tonight. but that's not much help if you need to know about the path of an approaching storm

Accu-Weather, a meteorological service that supplies radio and TV news with forecasts, has linked its database with a forecasting program. Metacomet Software's Accu-Weather Forecaster will dial the 800 number; download current statistics; plug them into map, chart, and forecast modules for

most any location; and keep ar-

chives of the reports. Although the CGA graphicsbased program is about 2 years behind the state of commercial

software (the menu-driven in terface is crude but easy to use), it nicely handles the daily downloading chore with about three keystrokes, and then prepares

lejo DAG Time 3 Basic Raps Ber bie Shaird Print Rain men

Accu-Weather Forecaster maps are derived from downloaded reports

trend analysis charts for barometric pressure, wind speeds, precipitation, cloud cover, the works. It will plot a forecast for the next 48 hours for every station that you inquire of. It takes about 2 minutes to fetch one station's figures, which costs about a dollar.

If you need to know about the weather, Accu-Weather Forecaster has far greater depth than CompuServe's National Weather Service reports. List Price: Acres Weather

Forecaster, \$89.95 plus on-line charge of \$.36, \$.46, or \$.56 a minute, depending on time of call. Requires: 256K RAM: CGA. EGA, or VGA: Hayes-compatible modem: DOS 2 0 or later

Metacomet Software Inc., P.O. Box 31337. Harrford, CT 06103: (203) 223-5911 CIRCLE 448 ON READER SERVICE CARD

Reset Switch Thaws Out Frozen PCs

HANDS ON

BY EDWARD MENDELSON When your keyboard seems frozen and not even Ctrl-Alt-Del can thaw it out, it's always better to use a reset switch than the big red power switch-if you're lucky enough to have one. IBM has never built a reset switch into its PCs, and the easiest way to add one is to buy Irata Systems' \$74 95 Irata-Reset Irata's switch tricks the com-

puter into thinking that the power has been turned off and on again, while actually maintaining full power to all disk drives, boards, and other equipment. This is better for your machine and your temper than the big red paddle. A reset switch doesn't produce the potentially damaging power surge that you inflict on your system when you turn the power off and on again.

Irata's switch comes in two models. The \$24.95 version for true Big Blue computers, from the PC through the Model 30,

uses a tiny circuit board that plugs into the power supply connection. You need three very small hands to install it, but nationce belos Boards for most

You can also build a different but equally effective switch with only a few cents' worth of parts. You'll find the method in

PC Magazine, September 16, 1986, page 340 List Price: Irata-Reset, \$24,95;

clone, \$11,95, Irata Systems, 2562 E. Glade, Mess. AZ 85204: (602) 926-7969

CIRCLE 449 ON READER SERVICE CARD

Best Way Yet to Search PC Magazine

subdirectory

HANDS ON

BY JENNIFER ZAINO In a perfect world, you wouldn't have to use the timeworn "hunt and peck" method to find a particular review in your back issues of PC Magazine. With the arrival of PC-NDX, the world has become more manageable.

PC-NDX indexes the 1986 and 1987 PC Mayazine product reviews, Productivity articles, Viewpoints, and letters. The massive databases are searched

by a Clipper-compiled shell. You perform searches by entering one or two keywords reflecting subject matter, author, product, and/or PC Magazine category, and a browse screen with a menu listing of the matchine articles appears. You call up a table of contents by entering a volume and issue number as the keyword. You use the Cursor Left and Right keys to select the year to search if both databases are installed in one

You move the cursor bar in the browse screen to highlight each entry. Pressing the Enter key on a highlighted entry calls up the citation screen, which provides the title of the article, its page number, a list of its keywords, and an abstract.

The program does have flaws. For instance, a search of the keyword "mouse" (for 1987) ignored at least one review in that category, while a search of some authors' names did not always reveal all the arti-

cles they had written For the most part, though, the searches are quick and accurate. PC-NDX is perfect for those who need to get their hands on a PC Magazine review with a minimum of fuss List Prices: 1986 PC-NDX, \$8:

1987 PC-NDX, \$9; 1988 PC-NDX (to be available quarterly), \$19. Requires: 256K RAM, two disk drives (hard disk recommended), DOS 2.0 or later. Not copy protected, PC-NDX, Mishawaka, IN. 46544: (219) 256-1045.

CIRCLE 450 ON READER SERVICE CARD

Introducing Paradox 386. Optimized for 386 environments and up to 5 times faster than Paradox 20



It runs in the DOS environment and is a modern must for power users confronted with very large

tables (tens of thousands of records or more) and/or large applications, Paradox 386 makes more ambitious mainframe-type applications feasible on the PC because it addresses up to 16 megabytes of memory.

But back to speed. Paradox processes data

32 bits at a time instead of just 16 bits at a time, so you race rather than run.

Paradox 2.0 and 386. The same but different

Paradox 386 gives you all the functionality, power, and flexibility that earned Paradox the Software Digest top-rating for PC relational databases.* Like Paradox 2.0, the all-new Paradox 386 gives you the speed and power to:

· Ouery multiple tables simultaneously · Use an unlimited number of selection criteria CIRCLE 137 ON READER SERVICE CARD

· Do pattern matches and relational operations on tables with up to 2 billion records

And Paradox 386 makes fast work of big operations like:

- · Retrieving data with large single or multi-table queries
- · Paging through screens of infor-
- mation as you view large tables · Sorting tables with several
 - thousand records
- · Developing applications with the Paradox Personal Programmer 386

· Running large memory-intensive applications Paradox 386 also lets you share

data on local area networks with workstations running different network versions of Paradox

Make the most of your fast new 386 hardware with our fast new 386 software

Get up to speed with Paradox 386. Your 386-based system has the racing engine, Paradox 386 is the racing fuel.

For information on upgrading from Paradox 2.0 to 386, call (800) 543-7543.

60-Day Money-back Guarantee **

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esigned exclusively for 80386-based systems.

Paradox* 386 runs un to

5 times faster than Paradox 2.0.

It's that much faster because it

accesses your full linear address

space, which in English means it

uses all the memory you or your

company paid for when you put

With Paradox 386, the old

together your 386 systems.

Micrografx Designer: The Best PC Graphic Design Tool Around



Just when the Macintosh is wooing aesthetically-minded PC owners with hi-res color graphics, Micrografx has taken the PC a giant step forward in design graphics with Micrografx Designer. This \$695 vector-based drawing package brings tools usually found only on dedicated graphics worksta-

tions and Macs to the PC Running under the Microsoft Windows, Version 2.0, operating environment (a Windows runtime version is supplied), Designer provides a full toolbox of drawing aids that are really useful only with EGA or VGA graphics and only on a machine running faster than 6 MHz.

Designer does not do 3D, is not a desktop publishing tool, and is certainly not a paint program. It can't compete with AutoCAD and other top-dollar CAD programs. Designer is the best drawing tool yet for logos. special graphics effects, and package design.

There are the conventional drawing tools, like lines, boxes, rectangles, circles, and arcs. And there are polylines, parabolas, bezier curves, object arrays, object rotations, object mirroring, object grouping, and

object connection. The display rulers bordering the top and left side can be set to different degrees of unit measure, whether you want inches, centimeters, picas, points, or

decimal inches Two-dimensional rotations are possible, as are linear arrays of one or a group of objects. Designer works in layers and uses color. This lets you create full-color images and

overlays for traditional printing. Designer supports the Windows fonts and some printers'

fonts. However, there is no way to interactively highlight and edit text while displayed with the art. In fairness, Designer's use of a text-editing window for any text additions is superior to the meager support in most de-

Micrografx Designer's clip art includes maps. The U.S. map is grouped as individual states, so sizing, moving, and color changing can be performed on any state.



ticrografx Designer Micrografx Inc. t820 N. Greenville Avc. Richardson, TX 7508t (214) 234-1769 List Price: \$695

Requires: 512K RAM, two disk drives (hard disk recommended), a graphics display adapter and monitor, DOS 2.0

> In Short: A top-notch graphics design software package. Not copy protected. CIPICLE 446 ON READER SERVICE CARD

sign programs, but Designer cannot wrap any text (multiple lines have to be entered one at a time), and changes to a font size make you lose your positioning

Designer and its sister programs, In+a+Vision, Draw, and Graph, all share the .DRW file format. But you can save Designer files to the .PIC raster image format.

Whereas paint programs were a good introduction to computer imagery and fine for creating illustrative art, Designer is the first truly productive design tool for creating mechanical or technical artwork.

Good Numbers Smooths Text File Conversions

HANDS ON

BY PETER LOSHIN If you've ever had to crunch numbers from a computer report, you know how galling it is to have to rekey the report. Good Numbers, from Creative Synergy Corp., eliminates this data entry chore, as well as the

risk of entry errors. Good Numbers converts any ASCII report file you can get onto your disk into PC-usable formats. Source files can be any ASCII file, as long as there are no records longer than 255 characters; output is to worksheet files (.WKI, .WKS, .WRK,

WR1). ASCII comma-delimityou try to exit without saving ed (for database work), .DIF (column-or row-wise), or .PRN

You create masks that screen out unwanted rows and columns of data, use entire lines as headings, and set column titles for the columns you use.

Good Numbers does a simple job and does it quite well. It's easy to use-following the sparse manual, anyone can convert a file within minutes of installation. Using Lotus-style menus, Good Numbers goes further by adding features such as auto-loading if there is only one mask file in the directory and double-prompting when

Nice touches include data format options for currency mark translation, control character search and removal, and line-by-line viewing and verification as the program translates. The current version doesn't handle numeric character fields like ZIP codes well, since numbers are assumed to be values

(Version 2.5, currently being

tested, addresses this and adds other useful features). Good Numbers will seem like manna from heaven for everyone who's struggled with the awkward data-importing functions in 1-2-3, dBASE, and othor applications.



Good Numbers, Version 2 Creative Synergy Corp. 2839 Paces Ferry Rd., #320 Atlanta, GA 30339 (404) 438-0033 List Price: \$189 Requires: 256K RAM, DOS 2 O or later

In Short: A data conversion utility that can translate ASCII files into other PC-usable formats. Not cooy protected. CIRCLE 447 ON READER SERVICE CARD

Quattro: The Professional Spreadsheet, for people who'd rather switch than fight

he switch is on. People and companies are switching from 1-2-3" to Quattro" because they'd rather switch than fight the problems, complications, limitations, and extra expense of 1-2-3.

Spreadshert users are seeing what they get right now with Quattro for only \$199.95 and are realizing that to go the 1-2-3 route they'll find themselves paying \$495 for it, then adding Lotus Learn, Lotus Speedup," and Lotus HAL" (\$150), which means \$645.00 or nearly \$450 more than Quattro, Quattr to either your wallet or the company's budget. Why do it?

They're switching to Quattro because it doesn't waste time

Quattro's intelligent recalc means that it only recalculates affected ceils instead of recalculating every cell the way 1-2-3 does it (unless, you've added their Speedup). Time counts too—and if you want to save yours—switch to Quattro.

There's everything to gain and nothing to lose If you already know a lot about

1-2-3, you already know a lot about Quattro. You're not faced with learning a new program because Quattro can be made to respond to commands like 1-2-3, but with much better, faster results.

You not only bring your 1-2-3 knowledge to Quattro, you also bring your 1-2-3 files to Quattro, Quattro understands them and lets you continue to work with them—and easily produce presentation-quality results. Switching to Quattro means you're

Switching to Quattro means you're not in a holding pattern waiting for the much-announced but never-delivered 1-2-3 Version 3.0. Quattro lets you act now.

Switching to Quattro means you avoid lengthy and complicated 1-2-3 installation procedures. Quattro senses the kind of hardware you have and installs itself automatically.



It's easy to learn and it's easy to switch

Quatro is easy to learn, whether you're just starting with your first spreadsheet or you're switching from 1-2-3. It's only \$199.95 and, because it's from Borland, it has a 60-day money-back guarantee.* You'll enjoy the switch to Quatro. Why fight it? Incides bot 5%" and 3%" disketes

60-Day Money-back Guarantee*

For the dealer nearest you, a brochure, or to order, Call (800) 543-7543



66 Quattro offers great control over graphs—now users don't have to go to a separate package to create business presentation graphics."

Steve Owens, Price Waterhouse

"With Lotus 1-2-3, I had to use a third-party program to annotate the graphs . . . I wasted a lot of time . . . But with Quattro, annotation and printing is integrated."

Bill Todd, Siemens GammaSonics, Inc.
"I find recalculation speed with
Ouattro to be more than twice as

fast as with Lotus 1-2-3."

Doug Cobb, President, The Cobb Group, Inc.

"I prefer the flexible Borland menu

system to the Lotus 1-2-3 menu.
and I plan to change all my macros
using Borland's menu system."

Ron House Western Union

"Those who are considering pur-

chasing 1-2-3 will be better off with Quattro.

John Walkenbach, InfoWorld 99



PC UPDATE

edited by Peggy Gavan

VCN Concorde, Version 3.

VCN Concorde, Version 3.0, offers many new features, including desktop publishing support through the TIFF and PostScript formats, VGA support, and full capabilities for creating business graphs, images, text, and self-running desktop videos. The new version also has enhanced text functions, more objects, and a new



VCN Concorde, Version 3.0, has full capabilities for creating husiness graphs and self-running desktop videos.

database. VCN Concorde, priced at \$695, is available to registered users for \$125. Visual Communications Network Inc., Cambridge, Mass: (617) 497-4000.

PC's Limited System 300

Dell Computer Corp, has replaced its PC's Limited 388-16 AT computable with an enhanced PC. Limited System 300, The new control of the Corp. And the Corp.

The Brooklyn Bridge,

The Brooklyn Bridge, Version 1.5, adds five new utilities, including four DOS utilities (MOVE, REMOVE, COPY, and BACKUP) and Run, a new Brooklyn Bridge utility that provides for dual independent processing. The Brooklyn Bridge is priced at \$129.95; registered users can upgrade to Version 1.5 for \$10. White Crane Systems Inc., Norcross, Ga.; (dold) 394-3119.

Wildcat!, Version 1.10

Mustang Software has released Version 1.10 of its Wildeat' bulletin board system. The new version supports additional file transfer protocols and offers a Live Program option that allows Wildeat' to run other applications from outside the program code. Wildeat', priced at \$129, is available to registered users free of charge. Mustang Software, Bakersfield, Calif.; (805) 395-022.

Microsoft Word 4.0, Network Version, ForComment

eggiated does of Microsoft Word 4.8. Network Verbines, but bleened immens the Net Verbines, but bleened immens the Mater Pack and three Network User Medical Packs are diplied to receive a free copy of the derband's ForComment. The network version of ForComment, normally priced al Systeports up to 16 users. The network version of ForComment, but are still priced of \$750 for the master pack and \$150 for each user pack; registered users of previous network version of comment, has a retail price of \$750 for the master pack and \$150 for each user pack; registered users of previous network version exsuppraid for \$75 for the master pack and \$4010 for high packs and \$150 for each week pack and \$4010 for high packs and \$150 for each user pack; registered users of previous network versions pack and \$4010 for high packs and \$150 for each user packs and \$400 for high packs and \$150 for each user packs and \$400 for high packs and \$150 for each user packs and \$150 for high packs and \$150 for each user packs and \$150 for each user packs and \$150 for high packs and \$150 for each user packs and \$150 for ea

Vendex HeadStart XT, Vendex Mouse

Vendex Pacific has begun shipping a memory upgrade kit for its HeadStart XT. The kit, priced at \$99.95, gives users an increase of RAM, from 512K to 768K. Also, Vendex is



Vendes Pacific is now offering a 256K memory approach kis to customers of its HeadStart XT compatible.

now bundling its new \$99.95 HeadStart Mouse with Logitech's Paint Show graphics software at no additional charge. Vendex Pacific, Great Neck, N.Y.; (516) 482-4255.

IN BRIEF

Conceptable: Corp., has introduced a Louts 23-20 driver, free for charge, for its Convolvation 2300 graphics system. The driver displays 180 columns by 40 rows of a spreasthere in a single screen. The Convolvation is priced at \$1,195.

The Convolvation is priced at \$1,195. The Convolvation is priced at \$1,195. The Convolvation is priced at \$1,195. The convolvation is priced at \$1,195. The convolvation is priced at \$1,195. The convolvation is the convolvation in the convolvation in the convolvation is convolved by the convolvation is convolved at \$1,195. The convolved

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Wm. "Bill" Wagstaff Vice President Customer Support



DIMIP 386-16/20 Turbo

JAMP 386-16/20 Turbo

Harbon and Bill organization

Life and the second and the s

Complete system price...... \$230 cystem without monitor. 2299
System with Samsung CGA color monitor. 2599
System with NEC Multisync II EGA monitor. 2999
System without hard data drives.



DAMEP 286-16/12 Deluxe Baby Turbo

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System with Semsung CGA color monitor. 1489
System with NEC Multisync II EGA monitor 1999
System without herd disk drive. 889

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Designed specifically for hard disc and critical use harmess sestems," reads the aid vertisement for this Topic uninterraptible power sapply but kup and. Must be a hard disk card tacked more inside the computer.

Microsoft Words

Just below the sealed flap of the envelope containing Microsoft MS-DOS 3.3 is the warning "Carefully read the Microsoft License Agreement inside before opening this pack!"

Amazing Facts I

"In order to initiate communications ("log on") to a BBS, you call the BBS, turn on your modem, and press a sequence of keys."

-Computer Shopper, February 1988

Amazing Facts II

"The [deskside] Flexarm Swing Cradle can accommodate virtually every PC or mainframe that's on the market.' -Lyben Computer Systems

catalogue ad for system/monitor stand

Amazing Facts III

"Since IBM introduced its first PC in 1981, the original operating system from Microsoft. MS-DOS, has ruled. Short for

'data operating system," DOS is the brains of a PC. -Seattle Times, Jonuary 25. 1988

Amazing Facts IV

"These difficulties (with Bankamerica's Masternet accounting system) were caused by slow run and response times, communications problems and leaky disk drives, according to a former Bankamerica employ-

-ComputerWorld, Febru-ary 1, 1988

Amazing Facts V

"The \$4895 Artisan Model 1023 handles A- to D-size drawings on cut-sheet paper and film, plotting 30 ips at an acceleration rate of two gigahytes."
—Computer Graphics World, February 1988

Campaign Notes '88 "At the heart of the Dole cam-

paien's New England operation is a 16 MHz Compaq 386. The organization has added a 130 Mbyte hard disk for tape backup to complement the 4M bytes of RAM inthe Compag." -PC Week, February 2.

1988



(PC-AT/XT Compatib checker not included; title page

of Northwate Computer Systems in

GENERICACME COMPUTER CO

ORGANIZATIONAL CHART





Have you heard or seen anything offbeat, unasual, or just plain damb about the micr commuter industry? Send your offerings to Communicasis. PC Magazine. One Park Avenue, New York, NY 10016, or MCI Muil 157-9301. Please print your name legible: include the name, city, and publication date of any newspaper or magazine clipping; and include your T-shirt size. Contributors will receive \$50 and a PC Massarine Tshart. In case of duplicate entries, the earliest postmark prevails, Sorry, but entries con't be acknowledned

Winners this issue: John Husselman (Tonus: UPS). Ted Wilson timellegens keyboard), Victor Volkman (BBS logon), William M. Muckerheide (Flexurm), Stephen Gates (data operating system). Mauro Saroklelli i Microsoft license agreement). Contributor Stephen Gates of Tacoma, Wash. ("MS-DOS data operating system") notes (a) "it's somewhat embarrassing to have such an error published" in Microsself's backward, and (b) salespeople were exceptionally polite to Gates when he

was shopping for a compager last summer. No. no relation.



dBASE Power for 1-2-3

Last year we met a crazy programmer who said he could build a database with the power and capacity of dBMSE and put it inside 1-2-3. Well, he works for us now, and if you know anything about database programs, his baby

is going to knock your socks off.

Introducing @ BASE, a full-feature relational database add-in for 1-2-3. Now anyone
who knows how to use 1-2-3 is an instant
database wizard because @ BASE turns 1-2-3
into a nowerful "front-end" for database apoliinto a nowerful "front-end" for database apoli-

Huge capacity

cations. It's as easy as 1-2-3.

If you've every tried to use 1 - 2 - 3 as a database manager, there's a good chance you've run out of memory. That's because 1 - 2 - 3 stores data in the worksheet. @ BASE stores data on disk where record capacity is virtually unlimited. You'll never run out of memory again.

Brains and brawn

@ BASE companes with powerful standaleukabes programs like dBASE or R BASE, ® but it operates in concert with 1-2-3. You get the best of both works. 1-2-3 gives you tools for data analysis. @ BASE gives you data capacity. Beatins and beaven. It's a nice combination.

In minutes you can haiff a worksheet with

dynamic links to the database on disk. (The worksheet might present a sales recap by region.) Next month, for up-to-date results, simply See our ad on page 283 load and recale the worksheet. Fresh database information is automatically linked from disk

Industry-standard file format

@ BASE uses exactly the same file format as dBASE III and dBASE III Plus. dBASE is not required to use @ BASE. But fly on have standardized on dBASE, @ BASE filts right in. @ BASE reads and writes dBASE files directly. No conversion is necessary.

At less than a third the cost of dBASE, you may decide to use @ BASE instead of dBASE throughout your organization wherever users need easy access to dBASE information.

Serious Performance

@ BASE beats dBASE III Plus in benchmark tests.* @ BASE is up to 3.7 times faster!

dBASE III Plus	@BASE
12 sec	12 sec
7.1 min	L9 min
10.8 min	4.5 min
	Plus 12 sec 7.1 min

@ BASE works with 1-2-3 Release 2 on the IBM PC, XT, AT, PS/2 and compatibles. Only \$195. No competting add-in databases can match @ BASE for power, compatibility and performance. Nothing even comes close.

CIRCLE 282 ON READER SERVICE CARD

Introducing @ BASE (pronounced "at base")

@BASE™ puts the power of dBASE III Plus® inside 1-2-3.®

With @ BASE you can:

 Instantly transform an on-sheet database to a dBASE-compatible database on disk.
 Use 1-2-3 as a "front-end" for existing

dBASE applications.

Build a complete database application from complete hards 1, 2, 3 to control.

from scratch using 1-2-3 to control database functions.

@ BASE Features

Huge capacity – data is stored on disk.
 Occupies only 72K RAM + 8K per open file.
 Fully compatible with dBASE III file format.
 Flexible data structures:

- Table view - Form view

And much much more!

- Crosstab view
 Powerful Query/Selection comman
- Bi-directional data transfer between worksheet and database.
 Dynamic link between worksheet and data-
- base using new database @ functions.
 Fully compatible with 1-2-3 macros.
- Multi-level sort (ascending/descending).
 Global multi-field search and replace.
 Create/modify database definition.

You can open, access and update multiple data files concurrently using special @ db functions. An optional module, available soon, less you "join" data files on one or more common fields, and support index files. Option price is \$89.95.

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dBASE Users! Independent Reviewers Sav:

Nobody Beats The Fox Nobody's Even Close



FoxBASE+ Quicksilver Clipper dBASE III PLUS

Data Rased Advisor

BYTE Magazine

FexBASE+ Fastest By Far

BYTE* benchmarks show that FoxBASE+ takes only 14 minutes to do what dBASE III PLUS needs an hour to do. The others are even slower. Clipper needs an hour and 17 minutes. Quicksilver needs an hour and 40 minutes

Nobody beat FoxBASE+ in even one of the 27 BYTE benchmarks.

FoxBASE+ zipped through the exhaustive Data Based Advisor** benchmarks in just 15.5 minutes. New FoxBASE+/386 ran them in only 7 minutes! By contrast Clipper took 53

minutes. Quicksilver took 59 minutes. and dBASE III PLUS took an hour and 18 minutes.

Why Waste Your Time?

BYTE's data shows FoxBASE+ is up to 7 times faster. DBA's benchmarks show FoxBASE + is over 5 times faster. You can run with Fox . . . or you can crawl with them.

FoxBASE+ Delivers Now...The Others Only Promise

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TOUGH TIMES AT THE MARKET



Things are tougher than ever for the buyers of computers for the corporation. Amid this vast richness of product offerings, they are often limited in what they can buy.

It's like starving in a supermarket. For lack of a decent shopping list, those of yeou with the biggest responsibility for personal computing in Corporate America face frustration. The market is changing so quickly that approval lists are going obsolete almost as quickly as they're published. At the same time, a pletchor of new standards has created more uncertainty than ever before.

As a reader of PC Magazine, you should be familiar with the term "brand specifier," because that's what you are. A brand specifier is the knowledgeable, computer-literate individual to whom others turn when they need to know what to buy. Whether or not you have the final sign-off on spending the money, your word is law when it comes to the make and model. That, of course, is what PC Magazine is all about. The whole process, from First Looks to the big comparison reviews to the productivity articles to the user exchange tips, is geared to giving you the tools you need to make informed decisions on hardware and software.

Frankly, I'm worned about 1988. It's tougher to steer a smooth course this year than any other. PS/2 or AT bus? 286 or 386? OS/2 or DOS? Graphics or text mode? Network or standalone? Host-dependent or workgroup? And what to do with all those sorry old 8088 machines?

Even the supposedly cast-in-concrete markets are up for grabs. Lotus 1-2-3 may be the Kleenex of spreadsheets, but Lotus will have to fight aggressively to retain market share as competitors press hard with everything from lower prices to eyepopping graphics. Ashton-Tate faces a similar challenge with dBASE IV. Can it keep the likes of Oracle and Informix at bay, much less Paradox? We'll see.

DOWN THE AISLES Let's take a rowby-row tour of this supermarket. We'll do a little comparison shopping along the way and speculate on these issues.

First, that grandsdadly of all debates, PSE2 vs. AT architecture. We've been talking about it for a year now, heard all the comparisons to New Coke and Coke Classic. For today's applications, however, the comparison of PSE2 add-in bourds have held back acceptance of the Micro Chanel, and you still card jet everything you want in connectivity products. Otherwise, the choice comes down to whether you're work environment. Haste to oversimptify, but that's about it. No one will be ready to



do anything significant with the multiprocessor features of the Micro Channel for another year or so, and the VGA is obviously the way to go for both buses, despite the inadequacy (too small, too fuzzy) of IBM's monitors. Watch the freshness dating on the package: insist on register-level compatibility for your VGA boards.

The 286 vs. 386 issue remains bot, with rotelier in sight. Due to AMD's inability to make fast, cheap 80286 chips, the low-sox 16 - and 20-MHz 286 machines fauled to materialize. Thus, the price differential to materialize. Thus, the price differential strong 15,000 to \$2,000. The 386 retains its performance edge, and the systems software types are giving you better reasons daily for using a 386. Between DeSQuier. Microsoft Windows 386, VMVISS, UNIX, and PC-MOS, there is something for example vision of the property of the strong the

Speaking of which, IBM's Bill Lowe has stated that the company expects to see 2,000 programs running under OS/2 by the end of 1988. Given that it started from zero, that's quite ambitious. We believe in OS/2 enough to convert 30 or 40 of PC Magazine's utility programs, but that leaves 1,960 to go. The extent to which Lowe is right is the extent to which OS/2 succeeds. The applications are the critical path to its success. Obviously, no one will convert all their users en masse to OS/2. The expense is too great, the benefits are too small, and the compatibility box isn't compatible enough. Although we'll see slow and steady progress through the year, 1989 will be the big one for OS/2.

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Meanwhile, the majority of software publishers are holding out for Presentation Manager. They're right in waiting. PM is the best shot we have at a standard user interface, and most machines sold today are PM-capable, I'm all for it. Corporate America will save millions on training alone. But PM applications won't hit big until late 1989. In the meantime, make

 Frankly, I'm worried about 1988. It's tougher to steer a smooth course this year than any other.

sure your hardware is ready for PM (286 or

386, EGA or VGA), and buy whatever applications you need to see you through. As we cruise down the video aisle it's clear that 640 by 480 is the way to go-this year. Pass by the offerings of more than 16 colors for now. Look for more resolution and larger screens. IBM's 8514 is stunning, albeit a little shy on contrast, but you can get it only in PS/2 form.

Meanwhile, what do you do with those dead lobsters at the bottom of the tank, the 8088-based machines? You can't palm them off on secretaries. They need real power, too. State-of-the-art word processing requires a hard disk. It benefits dramatically from a graphics screen and a fast processor for the spelling checker. Best bet: If you just want to run DOS faster, any of the inexpensive accelerator boards will do the job, such as PCSG's Breakthrough board. In order to leave the door open for OS/2, you need something special, like SOTA's MotherCard 5.0. The 386 boards for the PC will be interesting once they can run all the important programs, such as Windows/386, OS/2, DESQview 386, and VM/386. Until then, the 286 cards are a cheaper solution. You've got to do more than muddle

through 1988; you've got to come up with some strong recommendations, ones that set the stage for all the hardware and software goodies to come. See you at the checkout counter.



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THE FUTURE IS PAST



Looking back at a fast-moving industry trend that literally changed the world reveals the time when Dvorak actually came close to being wrong in print.

Tlike to talk about history in this column. I've always felt that to understand this business one must understand the industry's past. Recently I plowed through some old computer magazines and noticed that I've always overlooked one thing in my historical pursuit. I've discovered that I always look at what happened in the past from one dimension: I tend to look at the trends that were successful. I usually compare them to false trends or dead ends. What I ignored were genuine and positive trends that simply died for one reason or another. We can assume that this tendency for a successful trend to simply drop dead still exists.

Let's take a close look at the most significant event in the history of personal computing—the sudden death of the popular 8bit microcomputer.

The most notable trend in 1980 was the continuation of the 8-bit microprocessor as the king of the hill. When the IBM PC with the 8088 came along one year later, most pundits and observers felt that it was interesting, but harbly a candidate for a take-over of the business. Most observers saw it as nothing more than an adertain of a so nothing more than an adertain of a deal of with a "Baby Blue". Zead for it was a "Baby Blue" Zead of signed so the PC could run old CP/M software.

As the IBM PC began to grow in popularity, rationalization loomed for the 8-bit world. David Crellan, in his article titled "Don't Count Out the 8-bit Micro" (Computer Dealer, September 1982), poohpoohed the notion that the 16-bit computer meant anything to the marketplace. He

cited the long lead time from the introduction of the 16-bit microprocessor by the chip makers to the development of new systems as a signal that they wouldn't be popular. People weren't interested. People wanted highly compatible CP/M systems. Right. And Americans would never eat raw fish.

PC MOANS AND GROANS Bad-

mouthing the PC permented the scene back in 1981. In lad a newsletter at the time that supported a now-passe 8-bit system, and I accompanied a worker friend (a maker of a popular Z-80-based system) when he bought an early IBM PC to analyze. We tore it apart, and he moaned and greamed about how the carts were too long and too thick and too expensive and poorly de-centre of the popular and the popular and poorly de-centre of the popular and popular



the time. It was too bad the PC was a dog. I, became uncomfortable with the review and continued to research the new world of the PC. That 's when I ran into another friend—a techie who worked at Compartand. He raved about the machine. He was especially impressed with IBM's "professional" attitude compared with the "arrogant guys from Apple." He convinced me that the PC would be hot.

I went to the printer and with scissors excised the circular leview, leaving a peculiar hole in the document. This was no time to be hasty. I figured. Something was up. In no time, the world turned upsite down and the 8-bit makers were dead meat. It was pathetic how they refused to bail out of an airplane headed straight down. Worse, and the straight of the straig

But was the writing on the wall? Or were Datapro and the other research companies painting a rosy picture only too happily read by those vested in the old world of the Z-80? "There's a software base," they all said, "People buy solutions, not computers," they all said. "Z-80s are better than 8088s," they all said. But the people who counted weren't listening to what "they all said." The people who count still don't listen to what "they all say." They listen to each other and nobody else. If they go astray, it's not for long. And when the movers and shakers bail out, they waste little time. That's the lesson we learned from the collapse of the 8-bit

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INSIDE TRACK

PC vendors look for alternatives; the Mac threatens the PC on its own turf; rumors abound; theories teem.

The scenario worsens with every passing day. The newfound popularity of the Macintosh computer has the C-compatible makers—and even IBM itself—worried that loyal assers will be compared to the control of the control

pleased about fighting a second front.
Meanwhile, the Taiwanese and the
Korcans have prepared cases and are
ready to roll Mac look-alikes when
someone shows them how to do the soft-

This may come sooner than expected. On the West Coast, a tight-lipped cadre of software hotshots have supposedly developed Macintosh-emulation software that will be the core of any or all Mac clones and will be used as a base add-on for next-generation machines to be shown by NeXT and Sun Microsystems. (The only product yet marketed to make a quasi-Mac clone has been a thing called the Magic Sack. It turns an Atari 68000-based computer into a Mac clone. It's a pure hobbyist's product that requires the buyer to scrounge or copy a set of Mac ROMs. No known attempt has been made to reverse-engineer the Mac to date.)

The most amusing newcorner to the PC scene may be Sun Microsystems and its upcoming new entry to the personal computer scene—jokingly referred to as the SPARCintosh. Sun, a premier manufacturer of high-end personal workstations running UNIX and its own windowns software, has recently developed.

a RISC chip called the SPARC. For some unknown exast means the second unknown exasts (most) exast means (most) gradification, perhaps) the company feels of the company feels it can go toe-to-be in the low end to the it can go toe-to-be in the low end what one insider calls "a response to the what one insider calls "a response to the threat one is time of VME but means the company perceives as some sort of VME but means the some some sort of VME but means the sort of VME but means t

away IBM in the IC business too. If II-a humorous stoy I boning around the Industry. Sun likes to brag about in RISC clip by saying that it is the first compared company to the Industry of the II-a business of the II-a business of the II-a business of the II-a business of II-a

proach to the market. So what happens? Supposedly wunderkind Michael Dell (of PC's Limited a.k.a. Dell Computing fame) expresses an interest in the SPARC chip for some reason (gosh, let me try to guess what he might do with it--jewelry perhaps?) and asks Sun for more information, Meanwhile, Sun plans to use the chip for its SPARCintosh. It soon dawns on somebody that if someone like Dell got hold of the thing, he might make a cheaper machine than Sun will make. After all, Sun is used to those big minicomputer margins. Red alert! Panic sets in and meetings are held. What to do? What to do? Last I heard, Sun was flying some honchos to Austin to try to put together a joint venture of some sort with Dell to keep him from lowballing Sun with a PC cum Sun cum Mac do-all computer. As far as I can tell, it's all because the guy saked for a spec sheet. So much for idealism from the company promoting open architecture. I suspect that Sun will rethink all its malarkey and keep the next iteration of the SPARC to itself.

In the meantime, IBM wonders why nobody cares about it anymore. Suddenly (or not so suddenly) its machines and its users are now perceived as boring, As more mainframers (whose only concern is a better micro-to-mainframe link) move into the scene flashing a fat bankroll, they push aside the masses of small users who made Bill Gates a billionaire. The results of this shift are apparent at the trade shows. There is virtually no enthusigst-oriented PC show left. The only successful PC specialty show is PC Expo, a show mostly for dreary volume buyers looking for a good deal on a site license. The Macintosh crowd in contrast, has two huge specialty shows that pack them in and impress everyone. Not good for the future of the PC

To compound the problem, we now begin to see products like XDOS from Hunter Systems. It's a cross compiler that takes executable code from the MS-DOS world and turns it into 68020 code ready to run under a 68020 UNIX. According to our West Coast editor, you can take Lotus 1-2-3, grind it through this program and have Lotus 1-2-3 running under UNIX on a Sun. I don't believe it for a minute, but I'm willing to be convinced. It's stuff like this that makes things interesting during times of transition. According to sources, the new compiled code runs as fast on the 68020 as it does on an 80386! This is an ominous claim. Think of the possibilities!

Here's the challenge: let's see if we can get WordStar to run on one of those 68020 UNIX workstations. Talk about a giant step for manking.

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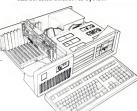
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A SPREADSHEET TAXONOMY. PART 2



In the second part of this series, Seymour looks at the Big Four new spreadsheet programs and offers his thoughts on how they'll be positioned in the marketplace.

hen it rains, it pours. After a couple of years during which we saw few good new approaches to how spreadsheets ought to work, we now have four major new entries in the PC spreadsheet derby With Lotus 1-2-3. Release 3, due in late

spring or summer, that's five. Count 1-2-3/G, the OS/2 Presentation Managerbased product that's due this fall, and that makes six.

The Big Four include Microsoft's Excel, PCSG's Lucid 3D, Borland's Quartro, and Surpass's Surpass.

PEGGING THE PROGRAMS Last time, I offered two tests for those considering switching spreadsheets. And I said I'd pass along a "spreadsheet taxonomy" I've worked out with corporate clients that can help them screen the new programs and get a handle on which kinds of spreadsheet users are likely to find each of these new programs a good fit.

One of the programs is easy to peg: Surpass. It's for the 1-2-3 purist, the user who damns Lotus for its slowness in improving

Surpass is in many ways what Lotus 1-2-3 might have been in Release 2.0. With multiple spreadsheets open onscreen at once, good use of the EGA's 43line mode, intelligent recalculation, and a command set that's a superset of 1-2-3's slash-this and slash-that, Surpass is exactly right for the 1-2-3 user who's hit the wall and wants not a new paradigm or a new approach, but just more "1-2-3-ness."

PCSG's \$99 Lucid 3D is a bit harder to

peg. I've been calling it an "Everyman's Spreadsheet," and I think that's how the market will position it. It's much more than an inexpensive alternative to 1-2-3.

While the idea of a pop-up spreadsheet at first suggests a less-than-serious product, it's impossible to work with Lucid 3D and not respect the ideas behind it.

Lucid 3D makes it easy to link spreadsheets, which don't have to be in memory. Building more but smaller worksheets. then linking them into a roll-up sheet, is almost always a better answer than building the kind of huge, unwieldy, debug-resistant spreadsheets 1-2-3 has encouraged.

Lucid 3D is filled with nice touches. One of the best is its screen-capture routine, which allows you to snatch a block of dead, lifeless numbers out of, say, a wordprocessing document, and slap 'em into a Lucid 3D worksheet about as fast as you can read this paragraph. You can go both ways, copying to its clipboard a patch of



your spreadsheet as ASCII text, then pasting that into an underlying document. (Beginning to see why a pop-up spreadsheet makes sense?)

Lucid's not for the power spreadsheet user who carves a notch in his PC every time he fills up his expanded memory card's RAM with a /File Combine spectacular. But it's a sensational product for a lot of people in business-most of them, I suspect, not using spreadsheet software.

BIGGER THAN BIG That leaves us with the two biggest programs of the Big Four—and the two hardest to figure: Excel and Ouattro.

Microsoft Excel is a great product. Sure, it eats up real estate on your hard disk. And demands a ton of RAM. And looks like hell unless you have an EGA or better display. And it really wants to find a 386 chip in your PC.

But it also gives you a great deal in return. And once you cross the threshold of all that computer power, it's no slug. In head-to-head tests on the same hardware (286 and 386 PCs) I've found it to be almost always as fast or slightly faster than 1-2-3, even when I use Lotus's nifty new giveaway add-in. Speedup, to make 1-2-3 recales a little smarter. Excel is for the open-minded PC user,

someone willing to invest the time needed to learn a new program-but with very high expectations for the return on that investment. More than any other PC software since 1-2-3 appeared, Excel rewards that kind of open-mindedness and fulfills those expectations.

■ JIM SEYMOUR

Which leaves Quattro.

Part of Ouattro's natural market is selfevident: price-sensitive buyers and companies. Typically selling for a third as much as 1-2-3. Excel or Surpass. Quattro is ap-

pealing to those who have to proliferate software further in their companies-on fewer dollars.

I like Quattro a lot. In some cases it's even faster than 1-2-3-though not as of-

ten as suggested in its ads. Borland emphasizes areas where Quattro is much faster than 1-2-3 (such as navigating around a spreadsheet, and recalcs involving exponentiation), while ignoring such operations as addition, multiplication, and divi-

sion, at which it's often slower. And I've found Quattro less 1-2-3compatible than claimed. Others, including our West Coast editor and spreadsheet guru. Jared Taylor, have also found 1-2-3 worksheets that bring Quattro to its knees.

 Surpass is exactly right for the 1-2-3 user who's hit the wall and wants not a new paradigm or a new approach, but just more "1-2-3-ness."

Philippe Kahn's marketing genius and the resources Borland can bring to selling Quattro certainly mean that it's not going to go away, and a street price just over \$100 also augurs for a long life. My educated guess is that Quattro will, over time, be tagged as the low-cost spread: good if not great, an amazing bargain, a product that scared Lotus and gave 1-2-3 its comeuppance . . . but which never dominates the market.

I see Quattro not as a replacement for 1-2-3 in many companies—a role Surpass and Excel clearly can handle-but as a way to extend the spreadsheet function to additional workstations, especially if the people driving those PCs aren't likely to become heavy-duty spreadsheeters.

But remember: we still have the ghosts of Lotus's new 1-2-3 R. 3 and 1-2-3/G hovering over the market. Unfair as it is to stack vaporware up against shrinkwrapped reality, that's what current 1-2-3 users are doing.

Next time we'll look at the Lotus gambit, and I'll wrap up my notes on how you can determine which of these programs is right for you.



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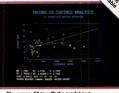
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How time flies: STEVE'S SILVER ANNIVERSARY



He was present at the birth of the personal computer. He's in a nostalgic mood. Of course, he would never think of blowing his own horn, but \dots

This is the gala 25th anniversary of the Viewpoints: Stephen Manes column. It was Epicurus or maybe Epictetus—I had bad flashbacks and had to miss class that month, as I recall—who uttered those immortal words. "Time sure flies when you're having fun." And I wouldn't give up a single one of the fillions of ticks of the old clock chip since then. It's been groovier than Flight Shaulator.

I've taken pains to avoid realling the details more than half a dozen times each year, so many of you may be unaware that I was present at the birth of the personal computer. It actually came about after 1 councid the eachy term PEDPAC (Personal Electronic Data Processing And Calculating that is become such an integral part of our vermexular: Back then, narrow-minded real part of the personal computer of the first part of the personal computer of the first the personal computer of the first the personal computer of the first the scale; the designer of the first three personal computer. Sirius, recognized my talent and hired me as chief of focumentation.

But in that six-man company! did a lot more than jux write manuals. For example, it was I who recommended our original LED-and-toggle-switch user interface. I firmly believed (and still do l) that key-board-and-monitor interfaces often lead users to think they know how to use their machines without ever having read the documentation. Believe me, nobody started messing with that original Sirius without our some pretty intensive book-learning!

Still, Dogstar Computing went belly up. Convinced nonetheless that these little dynamos were the wave of the future. I founded PEDPAC magazine, the fledgling industry's independent voice. Things were so hectic back then, I often seemed to be in six places at once—though I suppose that might have been the flashbacks again.

CREATIVE SPARK My famous checkered flamed shir gave Dan Bricklin the original idea for Visicale. A gravy spot on one of my signature bow hie space Wayne Ratiff the spark for his beloved diffASV "doe prompt." And Seymour Rubinstein and Rob Barnaby were inspired to create for the property of the property of the proference of the property of the protor of the property of the protor of the p

Then IBM changed the PEDPAC world overnight. In a move that some of my associates called "as gutsy as the attack on Iwo Jima," I started PEDPAC IBM magazine. Many have since offered many reasons for its unfortunate demise, but personally I think it was our hard-hitting no-compro-



mises editorial stance. Tough, honest articles like "Forget Floppy Disks: Cassettes Work Just Fine," my oft-quoted editorial "Do We Really Need Another VisiCalc Clone? Down for the Count, 1-2-3," and our centerfold of influential p-System users alienated potential advertisers.

Still, independence has always between 50th, independence 50th, indepe

SPITING PROHIBITED Perhaps my intensements measurement when I took on the authoritarian town of Tacochip. Texas, whose ordinance against expectorating on the public bus clearly violated the spirit of freedom we Americans cherish. I fortirightly stated that until the law was changed I would never set foot in the burg, and I urged that no computer organization even consider convenign in the new 250-seat high school Cafetorium, the "Eight Wonder of the Northwest Pashandle Wonder of the Northwest Pashandle."

Some readers claimed that piece had no place in this magazine, but the tens of letters, dripping with the indignation of expectoration rights advocates, clearly demonstrated my correctness. Though I am sorry to report that the ordinance remains on the books, I am proud that our industry

STEPHEN MANES

strongly resisted the blandishments of the Chamber of Commerce: no computer confabs have been held in Tacochip since I revealed its perfidy.

More recently, I fearlessly revealed that

our own PC Labs tests cannot be as impartial as we claim because of the shocking truth that every single PC Labs member has prior computer experience and some actually have been seen talking with hardware and software manufacturers. Unfortunately, the editors rejected my suggestion that we eliminate all possibility of bias by contracting the work to an outside firm that has tested nothing but high-tech refrigerator magnets for the past 3.7 years. However, I'm delighted to report that one of our competitors has done just that.

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PERSONAL ACHIEVEMENT As one who was present at the birth of the personal computer, I considered awarding quartercentury Manes Personal Achievement Medals here, much as I do annually to flatter industry bigwigs. But then I realized I'd have to leave out some deserving recipients in order to have enough space to recall my own personal achievements. So to those who've been almost as influential as I over the years, let me just say we all know who you are, gang, and nice work.

I had hoped the management might celebrate this festive occasion and perhaps help our subscription renewal rate by featuring a special wraparound gatefold cover with the logo "The Most Intelligent and Charming People in the Universe" and tiny pictures of all my loyal readers. However, our art director said it would be a real shame to waste so much white space.

But I do think it's important to note the caliber of attention this anniversary of mine has attracted. My electronic in-box is overflowing with congratulatory messages. Many are perhaps a bit too ribald for these pages, but let me assure you that a list of their senders would read like a Who's Who of the industry. Let me quote just one example from a fellow pioneer:

"Twenty-five years already? Seems like cons.

—Charles "Chuck" Babbage What of the next quarter-century? I predict that as computer use grows and our readership soars, I will become more popular and influential than Russell Baker, Art Buchwald, and Heloise put together. By the end of the century, I'll be ranked up there with Jonathan Swift and Edgar Guest. And I'll be using a supercomputer or at least a big network, because these lousy PEDPACs-uh, sorry, personal computers-just won't cut it anymore. As I may have mentioned, I was present at the birth of the personal computer; I plan to be there for the funeral.

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IBM'S PS/2 MODEL 80-111:

o ahead. Stare through your monitor screen into the world of adjudreams. Let your eyes glaze over with thoughts of harmony and perfection. What are you thinking perfection are you thinking perfection are you thinking for undiges, you're wrapping your fingers around the ultimate PC the cost-is-to-object, tybis-basking, fire-breathing, super-performance miracle machine of your fore-dest dreams.

Odds are your recipe runs something like this take Intel Corp's most powerful microprocessor, the 80386, run it at its 20 MHz maximum rated speed, cough get to a big, high-speed hard disk using an ESDI Chinanced Small Device Interface) controller, and build it using the latest surface mount circuitry and IBM's new Micro Channel architecture. Finally, pull out the runs gun and significant the most important force grant and significant the most important three letters that guarantee computibility, your needs of mini, and your fob.

With its renowned marketing savvy, IBM apparently tapped into our daydreams and came up with the Personal System/2 Model 80-111. This latest IBM electronic wonder doesn't just incorporate

Dream Deferred

all the features that fill your reveries, it also boasts of being the fastest, most powerful personal computer ever made by the largest computer manufacturer in the world. For \$10,995 you probably wouldn't expect less.

In fact, you'd probably expect more, but as it stands, the Model 80-111 is 25 percent faster than its prodecesser: the 16-MHz Model 80-071, upgraded with a 115MB hard disk. If your time is important, that 25 percent can be valuable indeed. But if your time is really in domand—and your mind is open to things that don't come in shades of blue—you'll

It's the most powerful PS/2 machine yet, but testing shows that the 20-MHz, 80386-based PS/2 Model 80-111 system is less than the sum of its parts. find greater speed and power elsewhere. What you get with the Model 80-111 instead is a very competent computer: the fastest PS/2 on the market today.

JUST ANOTHER PRETTY CASE Examine the inside of the Model 80-111, and you'll find no breakthroughs. The machine is merely a métange of components pulled off the shelf from the IBM Personal System/2 design school with a new system board bolted in

The one part of the Model 80-111 that sets it apart from its PS/2 peers is screwed to the right side of its case-cume-chassis—its planar (system) board. It looks most insignificant; just 10½ by 15 inches of green glass-epoxy layered with surface-mount components and big, square, dedicated VLSI circuits. To accommodate its higher speed requirements, the 20-MHz planar board has been substantially revised from the 16-MHz planar.

Hidden under the hard disk rack beneath the area where the D: drive would be mounted is an Intel 80386-20 microprocessor and a socket reserved for a 80387 numeric coprocessor. Both chips run at the full 20 MHz.

Just above the hard disk rack are two sockets for plugging in small memory boards. Only video memory is resident on



comes standard with 2MB RAM, a 1.44MB 3½-inch floppy disk drive, and a 115MB ESDIcontrolled hard disk. In benchmark testing, the hard disk reported an access time of 32.7 mulliseconds, not fast enough to keep up with the Compan Deskrot 36/20's 16-millisecond drive

FACT FILE

IBM PS/2 Model 80-111

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shith-resolution 8314 VGA display adapter,

In Short: The most powerful PS/2 system available, the Model 80-111 offers high quality and the guarantee of a long future of compatibility, but it fails to match the performance of the Compaq Deskpro 386/20 and represents only a slight improvement over the nerformance of its 16-MHz slibite, the Model performance of its 16-MHz slibite performance o

or. \$1,195

el 80-071. CRICLE 600 ON READER SERVICE CARD the Model 80-111 planar.

Standard equipment fills one with a projectary daughtercard that holds 2MB of dynamic RAM in 24 of 1BM's own 80-nanosecond chips (yes, that works out to about 750 kilobits per chip, with 1 bit per byte reserved for parity checking). More memory can be added either in the second socket or via expansion boards.

Unlike the 16-MHz Model 80-071, which uses ordinary flat memory, the Model 80-111 RAM is operated in page mode with a page size of 2K. This architecture allows repeated memory reads within a given page to be made without wait states. Memory writes within a page retuire one wait state. Reads or writes out-

side of the current page impose two wait states.

While the memory-cycle time of the Model 80-071 always angunted to 187 manoseconds, that of the Model 80-111 varied between 100 annoseconds (reading within the current page) to 200 nanoseconds (accessing outside the current page). According to 18th, the net result obtained by this architecture is 0.8 wait states, the same figure claimed by Compaje for the original 16-MHz Deskpro 386, which uses a similar memory configuration.

PC Labs memory tests do not favor this architecture because they involve moving large blocks of data between memory areast larger than a pure. As a result, in benchmark testing, both the conventional and extended memory areas of the Model 80-111 yielded roughly the same performance as the 16-MHz Model 80-071.

munce as the 16-MHz Model 80-471.
The Mirco Channel bus of the Model
80-111, operating at 10 MHz (one-half to 180-111, operating at 10 MHz (one-half to truck the superation of the superation of the truck through the system's reight-quarksides. Three of these slots are equipped with a bus width of 22 bits, while the balance have 16-bit bus widths, with one of the latter boasting an extended connector to accommodate video expansion. As standard equipment, only one 16-bit slot is filled with the ESDI hard disk controller.

The standard equipment hard disk, located in the rear half of this internal bay, is an IBM-made 115MB (formatted) unit that's equipped with a 10-MHz data-transfer-rate ESDI interface. In testing, the drive yielded a 32.7-millisecond average

access time.

IBM further enhances hard disk performance by logically simulating 64 heads (instead of the 8 physical heads) and supplying caching software (in the form of hidden files on the Reference Diskette included with the system) as standard equipment.

ment.

In operation, the hard disk subsystem is commendably quick and responsive—faster than anything else in the IBM PC product line. But compared with the competition, the powerful IBM combination seems somehow anemic.

Compay's choice for its top-of-the-line Deskpro 386/27—a l6 milliscond average access time drive, eaching software. SEDI interface, and innovative bus eagi-ESDI interface, and innovative bus eagities. Magezine, January 36, 1988)—earns the meshine a substantial performance lead over the Model 80-111 no mater how you messure it. Even in pure sequential file building through DOS, an area in which the Micro-Channel should prove its mettle, the Deskyro was more than 30 percent the Deskyro was more flower the Deskyro was more don't cond, resectively soft histolysts per second, resectively.

SYSTEM BOARD CIRCUITRY Built into the system board circuitry are several standard features. Besides the parallel and serial I/O ports (as with all PS/2s, the Model 80-111 parallel port does operate bidirectionally), included on the system board are the floppy disk controller, VGA video, clock, and CMOS Programmable Option

Select (POS) memory.

Because of the POS feature, the Model 80-111 system board requires no jumpers. no DIP switches, no mess, no bother. Instead, you run a system setup program on a copy of the Reference Diskette to configure not only the disk drives but also the options that are installed in the expansion slots. Overall, POS rates as a smart/dumb

■ The Model 80's hard disk subsystem is commendably quick and responsive. But compared with the competition, it

seems somehow anemic.

system—smart enough to know when you've changed something, but so dumb that you've got to go through the setup with every alteration you make. A smarter design would have been to have the system automatically configure itself to whatever changes it detected, warn you of any of the detected changes, and give you a chance for customization—all without obstinately

enforcing the setup process. Because VGA circuitry is built into the Model 80-111, all you need to do to have a functional system is add a monitor. As with all models of PS/2 beyond the Model 50, the Model 80-111 accommodates either a monochrome or color display. You'll need either an official IBM PS/2 display or a multiple-scanning monitor with analog inputs that can handle the 31kHz horizontal sync frequency of the VGA standard, like the NEC MultiSync II or the Sony Multiscan monitor. Software comnatibility should not be a worry because the VGA adapter has full backward compatibility with all previous IBM standards (but not Hercules graphics). Any evaluation of the performance of

the Model 80-111 video system depends on your standard of comparison. Compared with AT clones, even those based on the 80386 microprocessor, the Model 80-111 is squick—much faster in rewriting the screen than are EcAn dadpers. Compared with Compaçi s fib-bit VGA dadpers, however, the Model 80-111 is a slag. Compaçi s direct screen writes are nearly four times as quick when the VGA dadpers installed on a Deskpro 386/20. Indeed, the State of the

As with the other two stand-up FSCa, the Model 80-11 is not a desktop comparing the three three

Construction can be described as a molded reinforced plastic monocoque, with the plastic bearing full structural stress and providing support for all inner assemblies. The inside is lined with a silver-based conductive paint that traps interference within and earns the Model 80-111 the same FCC Class B rating (suitable for home use) as the rest of the PS/2 line. The external finish is spray-painted the pale white-beige shade that all office equipment has devolved to. Underneath that is a gray primer and plastic roughly the color of the top paint. While the topcoat color ensures consistent hues across different batches of plastic, the primer will make any scuffs, scratches, or abrasions readily apparent.

On the top of the case is a fold-down, util-length painted metal handle. Roughly rectangular in cross section, it is large enough to give a tolerable grip. The 40pound-plus weight of the machine marks it as a severe arm-stretcher, about as luggable as a small refrigerator. The Model 80-111 makes no pretense of being portable, however. The handle is designed solely to help tote the little barge between offices or departments.

REAR WINDOWS The back end of the Model 80-111 is all business and cables The power cable plugs into a jack at the top and hangs down nearly the full height of the case. No jack is provided for switched monitor power. At bottom are the eight silver faces of the expansion-slot-retaining brackets, stacked like aluminum venetian blinds

In between are the vital input and output jacks that are directly connected to the system board. From top down, the list reads: keyboard, mouse, parallel, serial, and video ports.

While the keyboard and mouse ports are identical and use the new PS/2-style connector (making them incompatible with ordinary PC and AT accessories), the parallel and serial ports follow the original PC standard female and male (respectively) DB-25 standard. The video connector is the female DB-15 used by the Video Graphics Array (VGA) system.

The front of the Model 80-111 puts the system's only nonkeyboard control, the power switch, at your fingertips in the guise of a big orange naddle near the top of the monolith. Next to it are a power-good indicator (once known as the "pilot light") and hard disk activity indicator.

Relow is a vertical stack of two 31/5inch drive bays. As standard equipment, one comes filled with a 1.44MB floppy disk drive. The other is prewired for a second similar unit or, perhaps, a third-party tane backup system

Farther down is a blank insert that hides a full-height, 51/4-inch drive bay. This bay has potential front panel access, making it suitable for an optical disk, cartridge hard disk, DC600-style tape backup system, or second hard disk

The entire physical arrangement is very handy, putting the disk slots at your fingertips. Sitting next to your work surface, the machine itself makes an excellent place to nut your coffee cup when the desktop debris becomes too dense

INNER SELF Access to the inner works of the Model 80-111 is accomplished by removing the left side of the chassis, which is secured by two large capture screws. Any coin of two bits or less fits the slots.

To prevent internal components from migrating to other systems via persons un-



Benchmark Tests: IRM PS/2 Model 80-111

he obvious comparison to make in the benchmark-test results is between npag's Deskpro 386/20 and the IBM PS/2 Model 80-111. An assist from Intel's 802385 memory cache controller makes the Deskpro's classic PC bus outperform the PS/2's Micro Channel architecture when it comes to the Conventional Memory test, and the 386/20's 70MB hard

disk outperforms the Model 80-111's big 115MB ESDI-controlled disk by nearly 2 to 1. Perhaps most startling of all, the new 16-bit Compaq VGA adapter's performance simply blows the IBM version off the charts.

The NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in incorprocessors and the effect of memory caching. This test executive aimost nothing but NOP ('No Operation') machine code instructions in a his 128K inno

The 80386 Instruction Mix benchmark test med the time it takes to execute a selected series of processor-intensive tasks. The test program use s are a subse of the total processor instruction set. The 80386 Instruction Mix implements a number of 32-bit operations. In the 80386 processor these beco ple instructions, whereas in the 6086 and 60286 nions of the benchmark test they remain multiple

sures processor speed by looping through a series sating point calculations, including multiplication, ion, airponentiation, and logarithmic and nometric functions. The benchmark program uses

256K of conventional memory and treats it as a serie of 64-byte records. Then, 16,364 random records at om records are read into and written from this memory. The res own is the average of the read and write times

The DOS Disk Access benchmark test mean takes to do a random sector read using DOS DOS buffers are set at 3 and the interleave factor is left at the drive's default setting. This test adds DOS's overhead to the BIOS and hardware times. The test program performs the sector read 1,000 times within the DOS disk partition. The average result is shown in

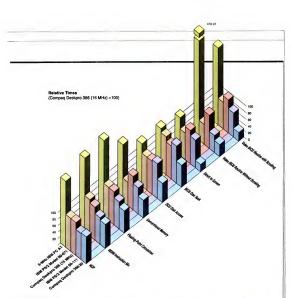
The BIOS Disk Seek benchmark test measures th BIOS. The test result includes minimal software overhead and may not parallel the manufacturer's claimed average access time. The test program performs 1,000 seeks. The average result is shown in

bandwidth of the video adapter by writing directly to the play memory buffer. The test is performe mode 3. The entire screen is updated using the assembly language REP STOSW instruction with register CX equal to 2000. This is done 1,000 times and the result shown is the total of the 1,000 thats

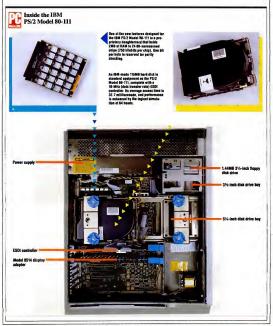
The Video BIOS Routine Without Scrolling benchmark test measures the speed of the BIOS Teletype routine without scrolling. The test is per-formed in video mode 3. The screen is cleared and 24 lines of 60 characters each (including a terminating camage return and line feed) are written to the displit through the BIOS Teletype routine. This is done ten times, and the result shown is the total of the ten tris

The Video BIOS Routine with Scrolling benchmark test measures the speed of the BIOS Tatetype routine with scrolling. The test is performed in video mode 3. The screen is cleared and 240 lines of 60 characters which w each (including a lerminating carriage return and line feed) are written to the display through the BIOS.

Takingse routine. Although the first 24 lines written to
the display do not involve scrolling, all the remaining.



Performance Times Times given in seconds except where noted)	NOP	80386 Instruction Mix	Floating- Point Calculation	Conventional Memory	DOS Disk Access (miliseconds)	BIOS Disk Seek (milliseconds)	Direct to Screen	Video BIOS Routine Without Scrolling	Video BIOS Routine with Scrolling
8-MHz IBM PC AT with IBM EGA	4.2	9.0	35.6	1.3	42.5	37.2	9.0	7.3	11.2
IBM PS/2 Model 80-071	2.1	4.4	15.6	0.6	33.3	33.6	6.6	0.9	3.7
Compaq Deskpro 386 (16 MHz)	2.1	4.0	15.5	0.8	33.3	29.2	7.9	1.5	4.8
IBM PS/2 Model 80-111	1.7	3.2	12.7	0.6	34.9	32.7	6.5	0.8	3.5
Compeq Deskpro 386/20	1.7	2.9	10.5	0.4	19.4	19 4	1.8	0.6	1.3





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known, IBM provides a vending machine/pay phone-style round keylock that mechanically latches the lid on. Logical access to the computer is governed by built-in password support in the machine's BIOS firmware. Three levels of protection are available: for the whole system, network use, and the keyboard alone.

Once you crack open the chassis, you'll see businesslike interior of a minicomputer. The design and mechanical construction rate as excellent, particularly from the points of view of simplicity, serviceability, and cost reduction.

As with the Models 60 and 80 before it, the Model 80-111 is not a no-tools design like the low-end PS/2s but an amalgamation of subassemblies. Of these, two metal skeletons, anchored to and stiffening the plastic monocoque, provide the mountings for disk drives.

A sheet-metal and plastic frame at the front and near the top of the chassis forms a nest for the 3/s-inch floppies. The drives slide home through the removable plastic front bezel of the chassis. The central spine of the case—the full-length 5/s-inch drive mounting rack—as a vital structural member. It also provides the latch area for the canture screws of the cover.

Mounting each of the two full-height devices in this rack involves either dropping it in the center of the rack or squeezing it through the front panel, then sliding it into place. Each device is held in position by two large pressure screws designed to be turned by the palm of your hand to clasp down on the drive mounting rails.

The full front-to-back length of the top Model 80-111 case is filled by the large chrome box of its 225-watt power supply. As with all current IBM units, this power supply automatically adjusts itself to any standard power source in the world in two ranges: 100-125 and 200-240 volts.

ranges: 100-120 and 200-240 votrs.
At the bottom from of the chassis is an almost vacant area in which the combined 3-inch loudspeaker and lithium battery assembly (the same assembly as in the other 1952 models) occupies a small corner. Around the innards of the Model 80-111, you find a purposefully arranged assortment of cut foam that serves both to absorb cost of the same and the air flow. In addition, a plastic plenum directs the inward arifow—sucked forwayth the chassis by

the power supply fan—over the expansion board area before the air courses through the rest of machine.

use rest or macune.
The standard keyboard is the familiar
101-key IBM Enhanced keyboard that incorporates all the features everyone seems
to demand (top-row function keys, separate cursor pad) and a few bothersome innovations (like the funny Curk-key location) as well. Nevertheless, the Enhanced
keyboard features IBM's famous positive
over-center feel, a slightly thin but still reassuring keyclick, and indicators for lockins Shift keys.

Neither PC-DOS 3.3 nor OS/2 are standard with the system, but the Model 80-111 will run either even without additional memory enhancements. Cassette BASIC is still built into the BIOS.

IBM includes a 1-year limited warranty with the Model 80-111, stipulating carry-in service. That means you're responsible for getting the computer back to the shop. Now you know what that big handle on top of the case can be used for.

DREAM BREAKER As with the earlier Io-MHz Model 80.11 is a smooth-running, tightly integrated system. Nothing can be faulted in the hardware or design (except that you've got to remove either the power supply or the hard disk rack to get the planar board out for service). IBM's engineers have done a good job. The Model 80-111 ranks among the best personal computers available.

But it's not the best.

Return to the daydream recipe you first conjured up for the perfect PC, and you'll see one glaring omission: backward compatibility. That's the price you have to pay for the advantages of the Micro Channel, or so we've been led to believe by IBM's marketing force.

As it turns out, however, there's still a lot of power to be wrung out of the oldfashioned PC bus. Compaq, with its professed commitment to that 7-year-old bus design, has out-engineered IBM's own miracle channel and bessed their Deskpro 386/20 with so much speed that it leaves the Model 80-III—and every other PC in the world—caught in the eddies of its supersonic wake.

The Deskpro reveals the many-forked data pathway of the Micro Channel to be a dubious virtue when what you want is performance. The strength of the Micro Channel—the ability to host multiple processors on the same bus—still lies in the future. In fact, while the Micro Channel may prove advantageous for running a video coprocessor, the VGA performance of the Model 80-111 in comparison with that of the Deskpro makes any superjority

doubtful.

Looking beyond performance issues, the Model 80-111 bears more evidence of IBM moving its mainframe marketing strategies into the PC arena—perhaps the outcome of IBM's internal restructuring that pulled PCs closer to its business main-

stream.

IBM's big blue mainframe boxes are not the top-performing computers in the world; they are just the best-selling. Of course, they are usell made and have enviably low failure rates. If they weren't good values, IBM wouldn't be the largest computer company in the world. The Model 80-111 fits the same product most.

Its pricing, too, fits the mainfram amount. Unlike earlier IBM efforts their IBM efforts their IBM efforts the inakes, add a profit, and hang a profit, and hang a formation of the machine—the PS/2 series is performance-driven. If you want a computer that's 25 percent faster, you've got to pay nearly 25 percent more. The undertaint more that the control of the profit of the same across the product line, tasking to toward the top to give you slightly more for your money the more you seend.

That's where the Model 80-111 fits in. It's not the fastest, but it is well designed and will likely prove to be rugged and reliable. It will get the job done, be it drawing like a workstation, dishing out data as a file server, or just crunching words and numbers 5 to 15 times as fast as an XT.

Is the Model 80 a bad bargain? That depends on how you look at it. If you want PC compatibility or the fastest personal computer currently available, the message from the Model 80-111 is clear look elsewhere. If you want the security of the IBM label, good performance, and the promise of great things in the future, you'll want to consider the Model 80-111.

Winn L. Rosch is a contributing editor of PC Magazine.



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ABOVE BOARD 2 LEAVES THE COM

Above*Board 2 is the first memory board for the PS/2" that comes with the new expanded memory specification—LIM 4.0.

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PETITION OUT ON A LIM.



The Modem Industry Standard That's Actually **High Performance.**

in a world of substandard stan dards, it's rare to find a standard that's also the criterion for high performance. But, Microcom Networking Protocol (MNP) " is the industry standard for high speed, error-free datacommunications: A Microcom Protocol Modem** uses MNP to virtually double the effective throughput of its rated speed. So our 1200 bps modem flies at up to 2400 bps. And our 9600 bps modem is lightning fast at up to 19,200 bps. And since the world is characterized by imperfect phone lines, MNP ensures completely error-free communications . . . even on standard dial-up lines.

What is a Protocol Modem"?

Microcom puts MNP errorchecking, protocol intelligence and other features in the modem . . . not burdening your computer. Microcom modems support common standards, including Bell 103, 212A, CCITT V.22, V.22 bis and V.29FT. The Microcom SX command set and Hayes AT® command set are both supported. And the highest mutually-supported speed is automatically negotiated with other moderns.

Microcom Networking Protocol": Why it Became the Standard

MNP offers unparalleled performance. Its data compression and errorcorrection have made it the protocol of

Microcom and the
Others The Difference
is Day and Night

Product Feature	Microcom AX/9624c	Major Vendor
Initial Fall-Back Speed	7200	4800
Installed base	s150,000	<1.000
Number of stored phon	6	
numbers	9	4
Employs industry		
standard MNP	yes	no
# of compatible MNP		
modern vendors	40 +	0
Supports CCTT V.29 FT		
modulation	yes	no
Password Security Option	n yes	no
Upgradeable product		
line	yes	по
Voice/Data Switch	yes	no
Hardware Settable Serie	al	
Port Speed	VPS	no

choice for fast, reliable data transfer. But, a standard must be used by others to really be a standard: MNP is supported by scores of other modern manufacturers and value-added networks, including GTE® Telenet/UNINET® (now U.S. Sprint). GEISCO®, CSC INFONET® and the IBM® Information Network. In fact, classes 1 through 4 are in the public domain. MNP Class 6 offers the highest

performance: Universal Link Negotiation starts at a common lower speed, and negotiates up to the highest. mutually supported speed and class. A Statistical Duplexing algorithm dynamically emulates full-duplex service. Data compression further improves effective throughput to as high as 19,200 bps. MNP Class S also uses data com-

pression to analyze user data and adjust compression parameters. An overall compression factor of 1.6/1 or 63% is achieved. Maximum protocol efficiency is 200% of rated modem speed when combined with other MNP features

MNP Class 4's Adaptive Packet Assembly generates larger packets over clean lines, for increased throughput and reduced protocol overhead. When increased error rates are detected, smaller and smaller data packets are created to increase transmission efficiency.

Class four produces up to 122% of Set Your Standards High with Microcom Protocol Modems

rated modem speed.

Don't accept closed protocols or inferior performance. Standardize on the high performance of Microcom. Ask for your full-color brochure on the complete line of Microcom modems and

network products.

Norwood, MA 02062 617-762-9310 Telex 710-336-7802

Set Your Standards High. CIRCLE 227 ON READER SERVICE CARD

BUILT for SPEED: 9,600-bps MODEMS

ood decisions require good information—data that the control of th

High-speed modems can transmit your files four or even eight times faster than the modem you may now be using.

people's data within our reach, minutes away. They eliminate the inconvenience of producing reports to be messengered to other locations, but—if the files you need are long—they also can tie up telephone lines and result in exorbitant telephone bills.

Technology has brought us a long way

Technology has brought us a long way from the days of 300-bit-per-second modems when sending a 100K file would tie up the phone line for more than 50 minutes. The 1,200-bps modems cut that time to somewhat more than 15 minutes; 2,400bps modems to around 8 minutes.

Within the last 18 months, manufacturers have brought 9,600-bps modems to market. This is not equipment to be used simply to connect to CompuServe or to chat with friends on a local bulletin board. It is high-speed, high-cost equipment, able to send messages at four times the speed of a 2,400-bps modem and bearing price tags that can top \$2,000. It is ideal for corporate use, where people need to send truly large files-budgetary analyses, perhaps, or all of last year's figures on sales activity in the West and South. They are also good vehicles for remote access to distant computers, minicomputer gateways and LAN to LAN bridges.

The 13 high-speed modems that we reviewed—the Cermetek 9600E, the Codex 2260, Data Race's PC-Race 2496, the Fastcomm 2496-T, the Gandalf Access Series V.32, the Hayes V-Series Smarnmodem 9600, the Microcom AX/9624c. the Real-Vadie 9600VP, Telebit's Trail-Blazer Plus, the Telenetics 9600E, Universal Data Systems' UDS V. 32, U.S. Robotics' Courier HST, and Ven-Tel's Pathfinder 18K—were all compatible enough to be used with PC telecommunications software that supports the Hayes AT command set. The products range in price from 3795 to \$2.095.

IN THE BEGINNING Codex made the first 9,600-bys modem. It appeared in the early 1980s, sold for about \$10,000, and was designed for mainframe communications. It is within the last year and a half that high-speed, 9,600-bys modems have become affordable and practical for PC communications. But attempting to choose the right one certainly can be a difficult proposition.

Until recently, buying a modem was relatively easy because you didn't have to worry much about compatibility. All modems of a given speed used the same modulation scheme. Regardless of what make or model of modern was at the other end of the line, your modem could talk to it. The standards that established this compatibility evolved from the exclusive hold AT&T had over telecommunications in the days before deregulation. For a long time, the only modems you could legally use were made and rented to you, just as telephones were, by AT&T. In fact, AT&T didn't even use the word modem. The devices were called "dataphones."

An FCC ruling in the mid-1970s, however, brought competition into the market and made it legal for people to connect non-AT&T devices to the phone lines. Just as new telephone manufacturers arose to challenge AT&T's Western Electric, other vendors began getting into the modem business. The modulation schemes of the dataphone became the standards, and modem manufacturers made their products compatible with the Bell 103 (300 bps) and Bell 212 (1,200 bps) dataphones. Those standards on 300- and 1,200-bps modems remain in place. But by the time 9,600-bps modems appeared on the scene in the early 1980s, many vendors were in the business. Without a single industry leader to dictate the new standards, the role became that of

the Consultative Committee for Interna-

tional Telegraph and Telephone (CCITT),

a technical and scientific standards group based in Europe.

WEIGHT OF LAW Although CCITT activities are technically called "recommendations" rather than "standards," they often have the impact of law. Members of the CCITT are national governments; in most European countries telephone systems are government monopolies, and it is actually illegal in some countries to use modems that don't follow CCITT recommendations.

 Within the last year and a half, 9,600bps modems have become affordable and practical for PC communications.

The recommendations that resulted in standards on 2,400-bps modern were straightforward and widely adopted. But unfortunately, in the arra of higher dependent moderns, technology has moved fastern than the CCITT. And the technical complexity of performing high-speed commencation has confused the issue. The CCITT has actually issued two recommendations on 9,600-bps moderns. Neither is completely satisfactory for general PC communications.

The V.29 standard, which is used in almost all fax machines, defines a half-duplex 9,600-bps modem, and the V.32 standard defines a full-duplex device.

Almost all standard PC communications software requires full-duplex modems. But V.32 moderns tend to be much more pricey; they average about \$2,500 each. The reason? The bandwidth of a telphone network is limited. Where standard 1,200-bps moderns can send and receive data on a telephone line at the same time, a 9,000-bps modern consumes all available bandwidth to send data in one direction. After data tones are sent by a V.32 modem, they must be echeed beek along the same line so has the ronders will recognize that the data arrived safely. However, the V.32 modern must be able to recognize that the echoes are echoes and not incoming data. For this reason, the V.32 modems require special echo-cancellation cruis cutties that let the modern keep track of what's been sent, compare it with what's coming in, screen out the echo, and recoming in, screen out the echo, and retinities of the compared of the comtine of the compared of the comceiver adds about S50 to the cost.

In an effort to produce affordable highspeed products for the PC market, modern manufacturers have developed several ingenious—and incompatible—approaches that use less-expensive modulation schemes to emulate full-duplex operation. In general these are termed pseudo-fullduplex modems, sometimes misleadingly called "asymmetrical."

PING-PONG PROBLEMS The most popular approach, represented here by the Fastcomm 2496-T and Data Race's PC-Race 24/96's BMX mode, has been to combine the widely available V.29 technology and the Rockwell V.29 modem chip set with a microprocessor and memory for buffers. This allows you to make a half-duplex modern that would automatically turn the line around when there was data in the receiving modem's transmit buffer. This so-called "ping-pong" method works fine for file transfers where the line needn't be turned around often. However, it can cause problems in more-interactive applications because standard V.29 devices take 253 milliseconds-over 1/4 of a second-to turn the line and train to the line conditions. Training allows two modems to determine the condition of the telephone line so that they can use the appropriate frequencies and protocols to transfer data.

transter data. Modern manufacturers looking for better performance in interactive applications developed faster training half-duplex modems. These are represented in this review by the Microcom AX/9624c, in which Microcom designed the modem to drop down in speed to 1,200- or 2,400-bps full-duplex when there is data in both modems' buffers. This is also the approach taken in the Racal-Valie (9600VP. Both are developed

GLOSSARY OF TERMS

ASYMMETRICAL MODULATION
The process through which a modern
working in a full-duplex environment
will simultaneously transmit data in two
directions at different speeds. An asymmetrical modern may offer high-speed
transmission in one direction, low-speed
in the other.

BAUD A state transition between two distinguishable nominal values on the communications line, or the number of these transitions per second. While this term is often used to mean bits per second (bps), each transition may represent more than 1 bit. The misuse arises because on a standard RS-232 interface, each transition represents one bit.

BELL 103 The American standard for 300-bps full-duplex moderns, developed by AT&T prior to a mid-1970s FCC ruling permitting competition by other manufacturers of communications products.

BELL 212 The American standard for 1,200-bps full-duplex moderns.

BPS Bits per second. A measure of the

speed of a communications device.

CARRIER A tone of a specified frequency that is modified per bit value for sending data via modern. A modern with a carrier frequency of 300 Hz might send 320 Hz tone for a 1 and 280 Hz for a 0.

modems with asymmetrical modulation schemes that provide a 9,600-bps half-duplex data path and a low-speed (typically 200-1,200-bps) data path in the reverse direction, often called the "reverse chan-

nel."

U.S. Robotics' Courier HST's and the PC-Race 24/96's interactive mode, use asymmetrical modulation. The Hayes V-Series Smartmodem 9600 uses the same modulation scheme as do V.32 modems, but in a ping-pong fashion, avoiding the cost of echo-sneellation circuitry.

CHECKSUM A method of describing a block of data, calculated by adding all the bytes in the block together and taking the low-order (right-side) 16 bits. This method will detect single-bit errors and some multiple-bit.

CPS Characters per second. Another measure of the speed of a communications device. Usually 10 bits per character is the standard in PC communications, although 9 bits per character may be used for high-speed transmissions.

CRC Cyclical redundancy check. A more sophisticated method of describing data than checksum. This method is more accurate in detecting multiple-bit errors.

DTE SPEED Data terminal equipment speed. The maximum speed each modem will accept data from its host computer. It is represented in bits per second.

FULL-DUPLEX Allowing simultaneous transmission in both directions. The telephone is an example of a full-duplex communications system.

HALF-DUPLEX Allowing communication in both directions—but in only one direction at a time. Half-duplex systems must have a method of letting the receiving end know that the transmitting end is finished, so that the receiving end can

Asymmetrical moderns theoretically perform better than ping-pong modems in two types of applications. The first is procoff lite transfers, in which the data travels on the high-speed forward channel and he acknowledgment packet takes the low-speed reverse channel. The second is interactive queries, like airline ticketing, in which keystrokes take the reverse channel and screens of data travel on the forward channel. In real life the reverse channel clauses, so it is also important for the modern

then transmit. An example would be a two-way radio system, in which the operator says "over" to signal the other operator to speak.

LINE TURNAROUND On a half-duplex connection, the process of changing the direction in which data is being transmitted.

PING-PONG A method of full-duplex emulation on a half-duplex link that provides automatic line turnaround when the receiving modem has outgoing data to transmit.

V.22 The CCITT standard for 1,200bps full-duplex modems.

V.22 BIS The CCITT standard for 2,400-bps full-duplex modems.

V.25 The CCITT standard of auto-dial commands for modems and other autodial devices. Not often used in the United States due to the popularity of the Hayes AT command set.

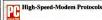
V.29 The CCITT standard for 9,600bps half-duplex modems, also used in facsimile machines.

V.32 The CCITT standard for 9.600bps full-duplex modems, not widely used for PC modems due to cost.

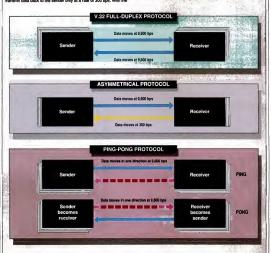
—Howard Marks

to turn the line around quickly. TrailBlazer Plus and Ven-Tel's Pathfinder 18K, which uses Tebelti technology, follow a unique multicarrier modulation scheme that theoretically makes the most of the available bandwidth. Rather than use one carrier frequenmation to the state of the available bandwidth, Rather than use one carrier frequenration to the state of the available bandwidth and the state of the available bandration to the state of the available bandtier and th

■ HIGH-SPEED MODEMS



■ joh-peed modems send and mookly data using three basic protocols: V2 bill-dupler, anymmetrical, and pring-pong. With the V.32 bill-duplex protocol, two modems can exchange data at a rate of 9,600 bits per accord in both directions at the same time. It works much like a telephone; two people can talk at the same time. Asymmetrical protocol allows the sending modern to transmit all feat a rate of 9,600 bps; at the same time, the noceiving modern is able to transmit data back to the sender ovil at a rate of 300 bps. With the ping-pong protocol, data will travel in either direction at the fast rate of 5,000 bps—but the moderne cannot shere the fine. Data moves in only one direction at a time, but the moderns will quickly reverse the direction of transmission, or turn the line, when the receiving modern has data to transmission, or turn the line, when the receiving modern has data to transmit. This process is comparable to that of two-way radio communications, in which only one radio operator can speak on a single frequency at a time.



modems using this technology connect. they send tones across the line and determine which of 500 possible carriers can be used on the phone line in each direction. From there on, the modems use those carriers and emulate full-duplex operation in a ping-pong fashion.

NEW STANDARDS—AND COSTS The CCITT has formed a study group to look at all these schemes and the compatibility problems that may result, but the earliest they are expected to actually produce a standard is 1992. Before then it is quite likely that the market will identify a de facto standard and the CCITT will just end up endorsing it.

Just a year ago the most-inexpensive V.32 modems were priced just over \$2,500. Now the UDS V.32 is priced at \$1,595, less than 20 percent under some of the more-expensive pseudo-full-duplex modems. The price crosion began with Rockwell's introduction of its 9.600-bns modern card. The card has all the features of a V.32 device, including the RS-232 interface. All a manufacturer has to do is add a Hayes-compatible auto-dialer and cabinet. Rockwell is selling the card for \$450 in quantities of 1,000, and we should expect to see modems based on this card appear in the market sometime this summer. Price erosion may affect standards if it produces a clear market leader

If the uncertainties about standards and price cause you concern, you may want to delay a planned purchase of a 9,600-bps modern until you see the results. Other alternatives for fast file transfer are available. Fax boards include a V.29 modem. and most fax boards come with software to transfer text files to another fax board of the same brand. Another alternative, especially for interactive applications, is to look at a 2,400-bps modem with MNP Class 5 or the Haves V-Series Smartmodem 2400. These modems are about 60 percent faster than regular 2,400-bps modems, and since they're real full-duplex devices, they will work better in a LAN-to-LAN bridge than will a ping-pong 9,600bps modem. The Hayes modem enhancer gives the same speed improvement to your existing 2400.

look at these modems. The best of them work well at most tasks-and any of them save hours when transferring large files. However, don't expect that what you buy will become an industry standard. Many of these modems could become obsolete if a single standard evolves, though even obsolete hardware can get the job done. -Howard Marks

CERMETEK MICROELECTRONICS INC. Cermetek 9600E TELENETICS CORP.

Telenetics 9600E The Cermetek 9600E and the Telenetics 9600E are identical in all respects and represent the minimalist school of modern design. No fancy LCD screens or front-panel

programming here-just push buttons and LEDs. Cermetek even uses a rather large (11- by 12- by 13-inch) off-the-shelf cabinet. In reality, both these modems are made by Cermetek, and they are priced the same at \$1 995

Like most V.32 modems, the 9600E excels at interactive applications using one of the remote packages like PC Anywhere.

FACT FILE

Cermetek 9600E Cermetel, Microelectronics Inc. 1308 Borregas Ave. Sunnyvale, CA 94088-3565 (408) 757,5000

Telenetics 9600E Telenetics Corp. 895 E. Yorba Linda Blvd. Placentus, CA 92670 (714) 524-5770

List Price: \$1,995 Requires: High-speed communication soft ware and float control.

In Short: A basic V.32 modern. Lake all the V 32s tested, it performed well on noisy lines. Ties data set ready (DSR) and clear to send (CTS) to carrier detect, which makes it difficult to use with most software.

Screen and keyboard are both responsive and, as any old-timer who used a CP/M machine with a 9,600-bit-per-second dumb terminal can tell you, 9,600 bps is plenty fast. To paraphrase AT&T, V.32 is the next best thing to being there.



If you have an immediate need for high- The Cermetek 9600E and the Telenetics 9600E are identical except for their names. They have a speed communications, do take a close | simplistic design, distinguished by two wide rows of cooling years at the top of the cabinet.

■ HIGH-SPEED MODEMS

The 9600E uses a customized LAP-B (Link Access Protocol-Balanced) error-correction protocol with a 16-bit CRC (cyclical redundancy check) and a maximum block size of 128 bytes. Unlike most error-correcting moderns, the 9600E was as responsive with error correction turned on as it was with it disabled.

One nince features of the 960E is its terral power supply. It comes as standard power cord, not one of the huge wall-transference varieties that many modern manufactures use. The front panel has LEDs for data terminal ready (DTR), modern leady, transmitted data, received data, high speed, error correction on, and modern check (which flashes if there are any data returnamissions). The 960E also has push nate a call that is already disaled, can force 4800 between 1960 lines, and can enable

The 9600Es support only high-speed communications, so you'll need to have a second modern for low-speed applications like calling MCI Mail. Cermetek has announced a new model—the 9600FR—that will add 300-, 1,200-, and 2,400-bps communications to the 9600E

error correction.

The 9600E supports the basic Haves Smartmodem 1200 AT command set, but there were problems with almost every communications package tested on it. The problem is in the way that Cermetek handles some of the RS-232 control lines-by tying carrier detect (CD), data set ready (DSR), and clear to send (CTS) together so they all go high or low at the same time. Most communications packages expect DSR or CTS to be high before they send commands to the modern, and then expect CD to go high when the two moderns have established a connection. On the 9600E you can set a DIP switch to make all three lines high all the time (making your software think there already is a connection) or go high when the two moderns are connected (preventing your software from sending commands to the modern). Complicating the situation, the follow carrier detect position is labeled "normal" in the manual. Carbon Copy's memory-resident module won't even load if CTS is low

Telenetics's documentation seemed a bit easier to understand than the Cermetek manual, but both of them are terse and

could benefit greatly from examples.

Overall, the problems with the RS-232

interface outweigh all the positive features of the 9600E. A PC user shouldn't have to customize his communications software just to make it work with a modem.—Howard Marks

CODEX CORP.

Codex 2260

It's easy to see from the Codex 2260 that Codex Corp, is serious about data communications. With its large size, the protective door over its controls, and its olivedrab paint job, the 2260 is an impressive piece of hardware with a military look about it. It lists for \$1.995.

In fact the 2260 is larger (16 by 8½ by 3½ inches), heavier (over 8 pounds), and—due to its internal fan—noisier than a T1000 laptop computer. Its internal structure is more like that of a computer than a modern. It has a separate power supply, card case, and a fan.

FACT FILE

Cudes Corp.
7 Blue Hall Rever Rd.
Cuntan, MA U2021
(617) 364-2030
List Pricer \$1,995
Requires: RS-232 cuble.
In Short: A negged V-32 modern recommended for factories and other hostile environments. Price well but doesn't support low-speed operation; at los lacks error correction and data compression.

Its performance, like that of the other true V.32 modems in our test group, was similarly impressive. No matter what we threw at the 2260, it just went its merry way—transmitting its data at 9,600 bps without skipping a bit. While the pseudo-full-duplex modems with data compressions.



The front panel of the Codex 2260 can be opened. Inside is an LCD and push buttons that let you set the modern's operating modes without software or DIP switches.

Discover. The only scanning system smart enough to know a Rose is a Rose. Is a

Discover recognizes a rose when it sees one. It can be in any of thousands of different type styles and sizes."— styles and sizes other scanners simply cannot read. Discover can read a rose that's in lext or graphics, whether it's typeset or laser-printed.

Discover will read them all and enter them into your personal computer. Without retyping.

Of course, a lot of scanners claim to do this. But the truth is that most scanners can only read "anything" if it's clearly typed in a handful of type styles and sizes. Which means that they can only do part of the job you need done.

Discover, on the other hand, reads virtually all the "real-world" information you receive everyday. Even third generation photocopies with broken, touching or blurred letters. And Discover enters all this, plus graphics and images, into most word processing, data base, desktop publishing or other Poprograms.* Quickly and accurately.

And that will save you an enormous amount of time and money. Because up to 55% of your keyboard time is wasted in retyoing. And there's nothing smart about that.

How does Discover make life so easy? With artificial intelligence-based software running on an independent 32-bit computer installed in your PC.* Naturally, Discover can work in the background while you work concurrently in other applications. That's productivity none the other scanners can match!

Scanning System. The Outre Scanners Carln's Ca

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8 to 24 point, Source: Technomic Consultants, Inc., March 5, 1967. MS/DOS, IBM PC, N, XT or Compatible.

The World's Smartest

2260's noisy line performance was flawless-even on lines the pseudo-full-duplex modems failed to work on at all.

In real-world use, the true full-duplex nature of the 2260 makes it perfect for interactive applications like remote operations with programs such as Carbon Copy or PC Anywhere. Using WardStar with Carbon Copy was almost as fast as if you were using it on your own PC. Using a 2,400-bps modem with WordStar was painfully slow, and with most of the pseudo-full-duplex modems the delays made it hard to tell what was going on. It was easier to copy the file to my PC, edit it, and then copy it back.

The only trouble I had with the 2260

 No matter what we threw at the Codex 2260. it just went its merry way-transmitting its data at 9,600 bps without skipping a bit.

was when I tried to use it with Haves's Smartcom II. well known for not working with "Haves-compatible" modems. Other communications packages-including Carbon Copy and Crosstalk XVI and Mk.4-were not only compatible, but worked without a hitch.

In addition to the basic Haves AT commands, the 2260 has its own Codex command set. Since Codex's primary market comprises data centers and mainframe terminal users, and you can't run software on a terminal, the developers try to make it as easy to use as possible. In that spirit they also gave the 2260 an

LCD and several front-panel buttons that let you set all the modem's operating modes without software or DIP switches. Codex even added a handy pull-out reference card with a magnetic cover attached to the protective cover of the 2260 where you easily can find it.

If you have a hostile environment like a

factory and need good interactive performance, you should consider the 2260. However, the 2260 doesn't support lowspeed operation and doesn't have error correction or data compression—the price you pay to get this kind of quality for only

\$1,995 -Howard Marks DATA RACE INC.

PC-Race 24/96

Data Race's PC-Race 24/96 is unique among the moderns reviewed here on two counts: it is the only internal modem that we tested, and it is also the only modem we tested that supports two different highspeed modulation schemes. The PC-Race comes with both a V.29 ping-pong mode and an asymmetrical modulation mode.

Theoretically, the ping-pong method is optimized for fast file transfers where all the data is traveling in one direction; the asymmetrical mode that has a 9,600-bitper-second forward channel and a 200-bps low-speed reverse channel is better for more-interactive applications. In reality,

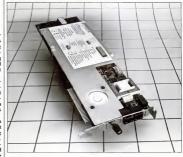


PC-Race 24/96 Data Race Inc. 12758 Cimarron Path, #108 San Antonio, TX 78249 (512) 602, 300

List Price; \$995. Low-speed-only, \$595; hugh-speed-only, \$795 Requires: High-speed communications so

In Short: A full-slot internal modern with both ping-pong V.29 and asymmetrical modulation schemes. Uses MNP Class 4 error correction in low-speed modes. Neither mode was a clear standout in throughout, but its fine performance on noisy lines may make it a good choice for users in rural areas. E 696 ON READER SERVICE CARE

even during file transfers, error-correction acknowledgements have to go back to the sending modem, forcing line turnarounds and reducing the advantage of the pingpong method.



The Data Race PC Race 24/96, a full-slot internal modem, bears a lobel with instructions on setting its switches and jumpers. It olso has a knob far volume cantrol and two phane jacks.



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* The compression throughput of MNP Class 5 is, like all compression schemes, dependent on the type of data being sent. The more "compressible" the data, the greater the throughput. For example, a typical text file transfer at 2400 bps should yield a throughput of between 4400 and 4800 bps. And the MultiModemi224Es. speed conversion and flow control leatures let you set your modern's RS232C port at 4900 or even 9600 bps, to take full advantage of the Class 5 compression Trademarks: MultiTech, MultiModern – Multi-Tech Systems, Inc : PC Magazine – Zifl Davis Publishing, MNP – Microcom Network Protocol licensed from Microcom,



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EASY SETUP. The PC-Rec is made up of a motherboard and two modem modules—mone each for the low-speed and high speed moderns. PC-Rec is a filled to piggytacked card—but if a not so thick as up the PC-Race is a breeze. Instructions for all switches and jaments are printed right on the modem. You can buy the PC-Race with both high-and low-speed modern istalled for 5995 or with just your choice of high-speed (1959) or low-speed (5595).

and upgrade later to support both. With the low-speed board installed, the PC-Race supports all the usual 300-, 1,200-, and 2,400-bps standards, including the V.22 1,200-bps standard used overseas. The PC-Race supports the basic Haves command set as defined by the Hayes Smartmodem 1200 and has additional commands and S registers to control those functions, like error correction, that the Hayes didn't have. Crosstalk XVI and Mk.4 worked with the PC-Race without a problem, but like most "Haves-compatible" modems the PC-Race would not run with Smartcom II or III. The PC-Race uses MNP Class 4 in its low-speed modes and a proprietary 16-bit CRC error-checking protocol in its high-speed modes.

In noise testing, the PC-Race performed very well, maintaining its performance on even the worst lines we threw at it. This was impressive since most of the other pseudo-full-duplex moderns either dropped the line or fell back dramatically when the line got bad.

While Data Race claims throughout up to 19,200 phs, our testing in the Labs showed that these speeds are possible only when sending identical characters. The PC-Race's data compression system was more variable than either the Hayes or MNP Class. 5 techniques, and the PC-Race was Race's throughput on text was 50 percent least than the identical data pattern as compared with a 15-1020-percent speed reduction for the others. In fact the PC-Race was only slightly faster transmitting each than it was transmitting random 5-bit data. Its was transmitting random 5-bit data. Its reference with fact, showing the property of the property of

The PC-Race's character turnaround performance was also disappointing, especially in interactive mode—where it took 179 milliseconds to echo a character. In

real-world use, these delays shouldn't be especially bothersome in interactive mode. In block mode they weren't as bad as some of the other modems in our tests, but the delays were a bit disconcerting, with characters often appearing on the screen in clumps.

Putting a good interactive mode and a good block transfer mode in the same modem and charging a reasonable price for the whole thing seem like good locks—but neither mode is so good as to make up for the other's medicore performance. Data Race would have a better product if it so-signers had perfected one mode or the other, rather than having spent their time developing both —Howard Mark.—Howard Mark.—How

FASTCOMM COMMUNICATIONS CORP.

Fastcomm 2496-T

One of the first high-speed modems in the PC market, the Fastcomm 2496-T is show-ing its age. The Fastcomm uses Rock-well's V.29 chip set, which is also used in many fax machines. Using the old chips results in the Fastcomm having a very slow



character-tumaround time

In fact the slow character turnaround is the single most significant feature of the Fastcomm. When I tested it on several bulletin boards that use the Fastcomm modems, the echo came so late that I answered questions twice and often hit extra returns. The slow line turnaround even



The Fastcomm 2496-T is a no-frills box with only a volume control and status lights on its front panel. The modern is cooled by six tiny cooling vents above the LED display.

made screens appear in fits and starts, since the modem had to turn the line around to send the acknowledgment packets for its proprietary LAP-B-based (Link Access Protocol-Balanced) error-correc-

The Fastcomm line turnaround is so slow because the two moderns must train, or adjust, themselves to the quality of the

The Fastcomm

2496-T's turnaround is so slow that some Xmodem implementations may timeout before they receive the acknowledgment.

line each time the line is turned around. This training takes about a quarter of a second—and if you have error correction turned on, the line must be turned several times for each echoe. In our tests it took over a second and a half for each character to be echoed. In real life you'll find your characters echoed in hunchs.

SLOW CONNECTION The Fastcomm also takes a while to get connected (up to 30 seconds in our tests), so you may need to adjust your software to wait for the carrier longer than you would for a standard

modem. Since the Fastcomm was specifically designed for file transfers, it performs them much better than a general-purpose modem. Its data compression really helps move the data sent over 1,000 characters per second on a perfect line. The line turnaround problem reappears when we use a file-transfer protocol; throughput drops to just 76 cps if we use Xmodem-like 128byte blocks and to 414 cps with a 1K block protocol. Fastcomm users should just use protocols like Ymodem-G or Zmodem that send data back only if there is an error. In fact, the Fastcomm 2496-T's turnaround is so slow that some Xmodem implementations may time-out before they are able to

receive the acknowledgment.

The Fastcomm manual is better than average and includes directions on setting up popular PC communications packages—including Crosstalk XVI. Rable—for the 2496-T. Fastcomm provides a copy of *Qmodem*, one of the more-powerful shareware communications packages, with their PC and external model.

The 246-T is a "Haye-compatible".

2400-bit-per-scond modem, and Fas-comm also makes 2 2,400-by modern that can be tighted to the 2496, as well as a 9,600-bys-only version that can be field upgraded to have all the 2496 features. The 2496 supports the basic Hayes command set from the Hayes Smattmodem 1200 and has several additional commands that are implemented differently than on Hayes's number models. I hallo problems using the manufacture of the 1400-bys modern supports the full Hayes Smattmodem 2400 command set.

2,400-bys modern supports the full Hayes Smattmodem 2400 command set.

Unfortunately, neither the data-compression nor error-correction features of the 2496 work when using the modern at lower speeds.

NEW MODEL DUE SOON Fastcomm could improve this product without too much effort by adding MNP error correction to the 2,400-bps mode, and by making the moderns drop down to 2,400-bps mode during interactive type processing—thereto processing—thereto the processing—thereto process

The 2496-T is available in a half-card PC bus internal, external, and rack-mount versions. Fastcomm has also announced a new model that uses asymmetrical communications like the U.S. Robotics or Data Race interactive mode. This should be much better at interactive operation and standard proteool transfers.

Unless you have an installed base of Fastcomm modems or special file-transfer applications that don't require operator interaction, you should look at other modems before the Fastcomm. Its slow line turnaround and lack of standard error-correction protocol make it a poor choice

when compared with the other models reviewed here.—Howard Marks

Gandalf Access Series V.32

The Gandalf Access Series V.32 does things well but always in its own way. One of the few V.32 moderns that also supports low-speed communications, it also uses the CCITT V.25 command set (a trait µnusual in a modern).

Like the rest of the V.3.2 modems in our test sample, the Gandalf performed flawlessly on our noise tests and echoed characters on the character turnaround test so quickly that you would have to set a new world record in typing speed to noise any delay, although some of the modems with data compression were faster in transmitting data.

Smaller than most of its V.32 competitors, the Access Series V.32 has four recker switches and ten LEDs on its front panler are LEDs for power, transmitted and received data, clear to send (CTS), carrier detect (CD), data terminal ready (DTR), off book, auto-answer (which also the phone is ringing), error control (which is lit in error-correction mode), and test status.

SWITCH CONTROLS The switches control the modem's self-test features, switch in between voice and data mode, and select any of its three command set modes. Mode 1 sets up the modem as a low-speed, 2,400-bps, Hayes AT command-set-compatible device. Mode 2 is



In Short: A quality V.32 modern that also supports low-speed modes. However, a poor manual makes it difficult to set up—even for experienced users.

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Smaller than most of its competitors, the Gandalf Access Series V.32 has two rocker switches on either side of its LED display. Cooling vents line the sides of the modern.

also Hayes compatible and adds highspeed communications. Mode 3 uses the CCITT V.32 command set to control the modem for both high- and low-speed oper-

Normally, PC users would just set the writches for mode 2 and go beit merry way, but unfortunately some of the modern settings, which Gandall calls "straps," can be set only by using the V.25 commands. This inconvenience is complicated by the fact that the Gandalf manual is written in British English and is often confusions.

Clearly not written with PC users in mind, the manual uses CCITT names and numbers for the RS-232 control line rather than the Electronics Industry Association anames that PC users are more used to. For example, DTR becomes 180.1 or terminal ready (TR), and CTS is 106 or modern ready (MR). Unfortunately, support is hard to find: Gandalf's address and telephone number are nowhere to be found in the user manual.

The back panel, inset about an inch from the back of the case, makes it awka Barton

■ The Gandalf echoed characters so quickly

that you would have to set a new world record in typing speed to notice any delay.

ward for you to plug in the ribbon cables. On the plus side, the Gandalf Access Series V.32 has a standard power cord that conveniently connects to the mains—so you don't need to find space for a huge transformer on your power strip.

The Access Series V.32 is a good modem greatly crippled by a bad manual. Gandalf could make it a better product by investing in some professional writing talent—Howard Marks HAYES MICROCOMPUTER PRODUCTS INC. Hayes V-Series Smartmodem 9600

The Hayes V-Series Smartmodem 9600 is a relative newcomer among high-speed modems. Being from Hayes, however, it's also the one with which others inevitably will be compared. On some points, as you might expect, the Smartmodem scores well indeed. Even on its weakest points, it

scores well enough.

One of the 51,299 Smartmodem 9600's best points is ease of use. While every modern in today's PC market claims Hayes compatibility, some are more compatible han others. Their differences can translate into problems in installation—often formag a search through your modern and communications program manuals before you can use the two together.

Not so with the Hayes Smartmodem. Virtually every communications program includes Hayes Smartmodem as an installation choice. In many cases there are even separate choices for the Smartmodem 1200 and the Smartmodem 2400.

The Smartmodem 9600, you can be sure, will soon rank among the choices as well. Until then, the choice of the Smartmodem 2400 will usually do. Like the 2400. the Smartmodem 9600 has no DIP



FACT FI

Hayes V-Series Smartmodem 9600 Hayes Microcomputer Products Inc. 705 Westech Dr. Norrmss. GA 30002

(404) 441-1617 List Price: \$1,299. Internal version for \$1,299 with Smartcom III, or \$1,199 for hardware only.

Requires: RS-232C serial board and (external only) shielded RS-232 cable with DB-25 connector. In Short: The V-Series Smartmodem 9600

gets high marks for maintaining compatibility with the earlier Smartmodern. Other good points include a useful set of status lights and the ability to use data compression and error correction at 2,400 bys and below. Performance on the PC Labs speed tests and noise tests was good though not specifically. GOICE #80.0FREACES SERVICE CAPO.

(Froduces asset as assessment	Courier HST U.S. Robotics Inc.	PC-Rece 24/96 Date Rece Inc.	Recal-Vedic 9600VP Recel-Vedic	Feelcomm 2495-T Festcomm Communice tions Corp.	Heyes V-Series Smartmodem 9600 Heyes Micro- computer Products Inc.	TraitBlazer Plu Telebit Corp.	Microcom AX 9624c Microcom inc
LOW SPEEDS	\$995	\$995	\$995	\$1,099	\$1,299	\$1,345	\$1,399
300 bps		Optional		Optional	•	•	•
1,200-bps 9ell 212	•	Optional	•	Optional	•	•	•
2,400-bpe V.22 bis	•	Optional	O	Optional	•	•	•
TOP SPEEDS							
Date compression	•	•	0	•	•	•	•
Felibeck (bpe)	9,600, 7,200, 4,000	4,000	7,200	7,200	None	In 100-bpe increments	7,200
Fell forward	•	•	•	•	0	•	•
Meelmum DTE speed (bps)	19,200	19,200	9,600	19,200	19,200	19.200	19,200
DIP ewilchee	•	0	0	0	0	0	•
Front-penel control	Ū	0	•	0	0	0	0
HAYES COMPATIBILITY	1						
1200 (original command set)	•	•	•	•	•	•	•
2400 (extended commend set)	U	0	•	0	•	0	•
Dielieg commeeds only	0	0	Ö	0	0	0	0
ERROR-CORRECTING PROTOCOL							
High speed	Modified MNP	Proprietery	MNP Class 3	Proprietary	Proprietery, AFI		MNP Cless 6
Low speed (2,400 bps sed below)	MNP	MNP Class 3	MNP Cless 3	None	None	MNP	MNP Class 5
	Pathilider 18K Ven-Tel Inc	UDS V.32 Universal Date Systems	Cermetek Cermetek electronic	Micro- Cod		settos SGODE S	Sendelf Access Series V.32 Sendalf Dens Inc.
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LOW SPEEDS	\$1,399	\$1,595	\$1,995	\$1.5	95 \$1,96		2,095
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300 bps 1,200-bps Bell 212	\$1,399	0	0	\$15 O	0	95 \$:
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300 bps 1,200-bps Bell 212 2,400-bps 1/22 bis TOP SPEEDS Dete compressive Fell berwerk (bps) Fell forward medium DTE opend (bps)	In 200-bps increments	O None 9,600	0 0 4.800 • 9.500	\$15 0 0 4.6	00 4,80	0 0 5	4,500
300 typ 22 to 122 2,400-bps Lt2 2bis 200-bps Lt2 bis 200-bps L	In 200-bps increments 19,200	O O O None O 9.600	0 0 4,600	\$15 0 0 4.8 • 9.6	00 4,80	0 4	0 4,500 3,600
300 pp L200-bps fell 212 2,400-bps Fell 212 2,400-bps PEEDS Dete compressive Fell branch (bps) Fell format DTE speed (bps) DIP wellthes Front-panel control	In 200-bps increments	O None 9,600	0 0 4.800 • 9.500	\$15 0 0 4.6	00 4,80	0 4	4,500
308 bps 4222 2.409-bps 422 bis 100 pps 422 bis	In 200-bps increments	O None O 9,800	0 0 0 4,800 • 9,500	\$15 0 0 4.6 9.6 0	00 4,80 00 9,60	0 6	3,600
1.200 - Spe sell 222 2. 2.400 - Spe 1.22 bis 2. TOP SPEEDS Dets commercester Feilback (tips) Fall torward Medinam DTE speed (tips) DIF exitions reactive from James control HAYES COMPATIBILITY 1200 (original commend ets)	In 200-bps increments 0 19,200	O O None O 9,800	0 0 4,800 • 9,500	\$15 0 0 4.8 9.8 0	00 4,800 00 9,600	0 6	3,600 3,600
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CIRCLE 539 ON READER SERVICE CARD



Hayes kept to its familiar design with the V-Series Smartmodem 9600. The front panel sports the same set of status lights as do other Hayes modems. There are no vents.

switches; it stores all modem settings in nonvolatile memory. More important, it has essentially the same command set, so that any program designed for the Hayes 2400 should work with the Hayes 9600.

During testing, the 9600 worked swimmingly with Relay Gold and Crosstalk Mk.4, set for the Smartmodem 2400. As expected, it also worked with ProComm, Crosstalk XVI, Smartcom II, and Smartcom III.

Another plus is the modem's speedy turnaround time. The 9600 managed a character turnaround time of 112 milliseconds—about ½0 second. The only faster times were for the more expensive, fullfledged V.32 modems.

SIMILAR APPEARANCE Physically, the Smartmodern 9600 is about ¼ inch taller than the Smartmodern 2400. Otherwise they are nearly identical—so much so that you might not notice the difference if the label 9600 wasn't written on the front panel. As with other Smartmoderns, the unit is just the right size to fit under a stantil.

dard, single-line desk phone.

The modern's front panel sports the same set of status lights as do other Hayes moderns: modern ready (basically a power-on light), terminal ready, receive data, send data, off hook (the modern has picked up the phone), carrier detect (the modern is

talking to another modern), auto-answer, and high speed. But one shortcoming here concerns the high-speed light—or rather the lack of ad-

high-speed light—or rather the lack of additional speed lights. The light comes on to indicate a 9,600- or 19,200-bit-per-second connection to the computer. Ideally, it would be helpful to know which speed the modern is using.

Also troublesome is that no indicator distinguishes between a 2,400-bps and a 1,200-bps connection. The modem can be set to report the speed when establishing the link, but with some programs you have to turn off this feature to avoid confusing the software.

As do other high-speed modems, the Smartmodem 9600 has built-in error-correction and data-compression schemes.

Error correction in the Smartmodem 9600 uses a proprietary enhancement to the CCITT LAP-B (Link Access Protocol-Balanced) error-correction protocol. The data compression scheme is also proprietary.

UNSHARED STANDARD What's nice is that the modern can use error correction and data compression at 2,400 and 1,200 bps while talking to the Hayes V-Series Smartmodern Quipped with the Hayes V-Series Modern Enhancer. Alsa, the company so far has chosen to keep this scheme to itself, thereby ulting out the possibility that it may become an industry-wide standard.

In addition to talking to other V-Series modems at slower speeds, the Smartmodem 9600 can talk to most other modems using Bell 103 protocol at 0 to 300 bps, Bell 212 or V-22 protocol at 1,200 bps, or V-22 bis at 2,400 bps. At 4,800 and 9,600 bps, the modem uses a half-duplex variation on V-32 protocol.

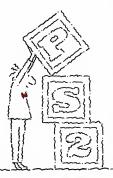
When esablishing a link, the modern takes about 13 seconds to negotiate the speed of the link and the presence or absence of data-compression and error-cetting protocols. This period is long enough that you may need to adjust the amount of time your program waits before deciding to cancel a call. No capability exists to adjust the speed of the transfer during a session to compensate for changing line conditions.

On the PC Labs speed test, the Smartmodern managed a respectable 1,129 cps—which placed it well below the 1,538 cps for Telebit's TrailBlazer. In the PC Labs Xmodern test, the Smartmodern ranked in the middle of the pack but remained ahead of everything else except the full-fledged, full-duplex V.32 moderns.

On noise tests, the Smartmodem again scored respectably but not spectacularly, failing only when facing a more-than-average amount of noise on a worse-than-average line.

All told, the Smartmodem 9600 is exactly what you'd expect from a company of Hayes's stature. It's a reliable unit with respectable performance and a high degree of compatibility with earlier Hayes modems. That, plus Hayes's well-deserved

The only family of modems for building better IBM PS/2" Systems.



The new Courier 2400/PS Family.

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communications software by Hilgraeve. This is one software package that fully deserves its rave reviews!

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HIGH-SPEED MODEMS

reputation for support, may be enough to make the Smartmodem 9600 your modem of choice.—M, David Stone

MICROCOM INC. Microcom AX/9624c

As might be expected from the inventors of the Microcom Networking Protocol (MNP), the Microcom ANO-824 uses the latest MNP Class 6 for full-duplex emulation as well as data compression and error correction. The AX-9624 uses the CCITT standard V.29 half-duplex modulation

scheme for high-speed communications. In addition to V.9, the AX962-ex supports the standard schemes for 300- to 2,400 belieper-scend communications in 2,400 belieper-scend communications in 1,400 belieper scheme for 1,400 bel

plex.

The AX'9624c uses Rockwell's latest V.29 chip set and its proprietary fast-train mode, which lets the modems adjust to the condition of the telephone line in 23 milliseconds—compared with the CCTIT standard 253-milliseconds training time. This fast-train mode let the AX'9624c echo characters in our Labs sess just 140 milliseconds after they were sent. In real-world testine, we found the AX'9624's full-du-



PC application.

In Short: A V. 29 half-duplex modern that
uses MNP Class 6 to emulate full-duplex operation. It introduced errors into our data
stream on a very mosty line.

ERCLI SEPT MERIAN SERIOGE CAND.



The Microcom AX/9624c has two push buttons and seven status lights on its front panel. Cooling vents line the three back edges of this sleek black modern.

plex emulation quite good.

The Microcom's data compression was also impressive. When transfering a highly compressible file consisting of several by compressible file consisting of several housand lowercase e's, the AX/96/24 cmanaged to transfer more than 1.850 characters per second. Transfering C language acters per second. Transfering C language code requeed throughput to a very respectable 1.400 cps. By comparison, truly random data—which should not be compressible—slowed transfer to 930 cps.

The AX/9624c supports most of the Hayes Smartmodem 2400 command set including the extended AT&T commands. The additional Microcom AT commands use a\((backslash)) delimiter to avoid future incompatibilities.

However, using both PC Labs performance test software and Crosstalk Mk.4, the modern would frequently remain online after the program told it to hang up. We also had trouble getting it to respond to the +++ escape sequence that returns a Hayes-compatible modern to the command state. Sometimes it would respond and at others it would just send the three pluses.

Microcom should work on the documentation for this modern. It has one manual for their 1,200- and 2,400-bps modems and a 24-page photocopied addendum for the AX/9624c. When you take into account the number of registers and commands the AX/9624c has to set, all the MNP features, as well as handshaking and normal modem parameters, you end up doing a lot of paper shuffling to configure the AX/9624c. Buyers of a \$1,000 modem deserve a manual written specifically for it. Also confusing is that Microcom modems support a proprietary command set called SX in addition to the more common AT commands, and the addendum alternates instructions for the two modes.

Microcom thoughtfully included both DIP switches and a volume control in the DIP switches and a volume control in the AX/9624c. Many new moderns do everything in software, giving you only three volume levels—that are usually too soft, too loud, and much too loud. Similarly, it

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Non



Performance Tests: High-Speed Modems

All ingh-speed moderns are not created equal, as these less results demonstrate. The standard V.3 zm odderns from Universal Data Systems, Cermetek, Codex, Candall, and Telenetics all performed about the same, but the pseudo-full-duplex moderns—half-duplex ones that emulate full-duplex through a virtually indistinguishable line turnaround—were very different from each other and different from the V.32s.

Among the pseudo-full-duplex modems. the Hayes V-Series Smartmodem 9600, the Microom AX/9824. Telebit's TrailBlazer Plus, and Ven-Tel's Pathfinder 18K stand out for the quality of their full-duplex emulation as represented in the Character Turnaround tests, while performances of the Fastcomm 2496-T and Data Race's PC-Race 24/96 were significantly worse than average. Data Race's PC-Race 24

96, in both modes (see review), fared better in the Xmodem test, ranking just behind Hayes's and Microcom's modems.

In throughput tests, those pseudo-full-duplax modems offering data compression—such as Telebits TrailBlazer Plus, U.S. Robotics' Courier HST, and the Hayes V-Series Smartmodem 9600—stand out by transmitting data up to 50 percent faster than the V.32 standard modems, depending on the type of data being transmitted.

Performance also varied dramatically over noisy phone lines. While all the 1/32 modern were essentially unaffected by the While all the 1/32 modern were essentially unaffected by the levels of noise we used, most of the pseudo-full-duplex moderns slowed down as the line got noiser, and failed to transmit at all once the noise reached the ear-splitting levels of 20 to 1/4 focibels/relative noise.

A low speed (1,200 or 2,400-bh-persecond) modern is by nature a relativelysecond modern is by nature a relativelyper second produced in the second produced in over the shipphone network. And it takes notes at masset over the phone line and convents them to data your PDC can understand. Low speed moderns differ in how wall they cut handle the node and in contract the contractive of the node and in contract the contractive of the node and in contractive to the otherwise they open as eccording to the Bed 212 sandards specified by ATS or CCITT sandards

High paped moderns reviewed here however face greater obstacles to efficient operation. To evercome he telephone networks intends canneled to expend to to high speed modern design at to send delet over the photon line only over direction et a time. The more effordate in high speed modern use this helf duples method and entitles lad duples moderns by saving prisma befores and most possible saving prisma befores and most proposassions. Some models and impossible saving adding data compression and erm corne-

The chellenges these products face make starry them much more difficult then sterry better over people counterparts. We need to lets whether the file dispers the chellenges are sterred to the sterred to the sterred to give without heaving the echoed characters return so slowly that we control event we rever made. We also meed to examine how well the data compression and enerc connection work, and how well it modern is throughput is impeded by noisy phone lines.

For seating we used the IBM PC.AT's impriving pathwere developed specifically for impriving pathwere developed specifically for the pathwere developed specifically for the pathwere designated the "master", the other, the "sizes" "the COMIT port of seath AT level connected to the model the pathwere developed between them. These channels simulations account on the pathwere developed the pathwere pathwere developed the pathwere developed the pathwere developed the pathwere pathwere developed the pathwere pathwer

To communicate bring information between master and stere we linked the COM2 poins of the bee ATs. Those ports were connected using a ruli modern cable to allow the lavo computers to communicate without any possibility of delay. The master computer site had a connection from its COM3 port to control the TAS 1010 channel simulations.

In the Chreactest Turnescould rost, as som, or character for meast to Slave, which mimodately echoed it back to the master. The response Superior shall be superior to the response Superior shall be superior to milliseconds are bothersome to some system. But when the delaye resolution of distinction, a recessary consideration for a company a purchasing officer. Mar repeating prisp process severel three. We company to the company of the company of company a purchasing officer. Mar company a purchasing officer. Mar character. The step, in addition, is situla general endication of how with the possible character. The step forther than 15 duples. The Mixed and the Xmoders tests comprise the summation of a bettery of tests designed to determine how lest the moderns harrown diet on a throughout tests designed to determine how lest the moderns harrown diet on a throughout health test of the second diet of the second diet of the second diet of the second diet of the meater compare to the state which checked each type for end of the second diet of the seco

In decreasing under of articipated compressability, his deprehens were a stream of derivatil character of longuight exposure programment of derivatil character of longuight exposure programment of participation and participation of the part

Performance Times

	Character Turnaround
Fastcomm 2496-T	1,614
PC-Race 24/96 (ping-pong protocol)	248
Recal-Vadic 9600VP	206
Courier HST	196
PC-Race 24/96 (asymmetrical protocol)	179
Pathfinder 18K	160
Microcom AX/9624c	140
TrailBlazer Plus	122
Heyes V-Series Smartmodem 9600	112
Cermetek 9600E	81
Telenetics 9600E	81
Codex 2260	55

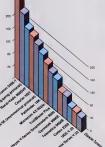
Performance (given in characters per second)

Gandalf Access Series V.32

UDS V.32

	Mixed	Xmodem
Fastcomm 2496-T	1,007	76
PC-Race 24/96 (ping-pong protocol)	910	320
Racal-Vadic 9600VP	800	85
Courier HST	1,248	225
PC-Race 24/96 (asymmetrical protocol)	695	317
Pathfinder 18K	1,473	157
Microcom AX/9624c	1,163	334
TrailBlazer Plus	1,538	136
Hayes V-Series Smartmodem 9600	1,129	384
Cermetek 9600E	957	488
Telenetics 9600E	957	488
Codex 2260	957	675
UDS V.32	957	676
Gandalf Access Series V.32	607	957

Relative Times (Hayes V-Senes Smartmodem 9600 = 100)



52

46



Performance Tests: High-Speed Modems

F or the other high-speed-modern throughput tests, we set the TAS 1010 channel simulators to emulate a perfect telephone line—that is, with no line noise whatsoever. For the Signal-to-Noise Retio test, however, we measured each

whatsoever. For the Signal-to-Noise Ratio test, however, we measured each modem's performance on noisy lines. For this test, we programmed the channel simulators for a worst-case longdistance line and measured the modems'

throughput at varying "decibels/relative

Signai-to-Noise Ratio

(Results given in characters per second for each level of decembrishing noise)

noise" levels. Since the TAS 1010 provides line impairments in only one direction, we connected two TAS 1010s back-to-back to provide a bad line in both directions.

Test results are presented on graphs of throughput in characters per second (cps) versus decibels/relative noise. Line quality decreases from left to right on the graph. Modems with higher graph lines have higher throughput over a range of noise levels. Higher throughput in this case represents better immunity to telephoneine noise. Some modems were unable to complete all the tests because they stopped transmitting accurately or stopped transmitting altogether at certain noise





























can be difficult to set up a modern that only uses software commands if you have to change the way it comes out of the box. The DIP switches can be overridden by software commands if different programs require different settings. It's nice to have a choice. It would also be nice to have a knob on the volume control so you don't need a screwdriver to adjust it.

Surprisingly, the Microcom was the only modem we tested that allowed errors to pass in the noise torture tests. While most modems just dropped the line when the noise level got too high, the Microcom actually introduced errors into the data.

The Microcom AX/9624c is a fair performer overall, but its poor performance on noise tests, confusing documentation, and problems in hanging up make it less than stellar.—Howard Marks

RACAL-VADIC Racal-Vadic 9600VP Racal-Vadic has a long and well-deserved

reputation for making rugged and innovative moderns. Its 345 was the first full pilex 1,200-bit-per-second modern available for dial-up applications. It even beat AT&T's Bell 272 to market by several months. But it wasn't clear until lowercost 212-compatible models became available that the 212 "standard" would really become established.

Once again, with no clear standard in place, Racal-Vadic has taken an innovative approach to solving the problem at hand. Rather than build a ping-pong or





The Racal-Vadic 9600VP has a low-profile cabinet and a stanted, easy-to-read display with LEDs in its answer buttons. Cooling vents are located toward the back.

asymmetrical modem, Racal-Vadic decided to have its 5995 9600VP drop into 1,200-bps mode when there was data to be sent in both directions. Racal-Vadic uses the widely available Rockwell V-29 modem module in the less noise-sensitive 253-millisecond standard mode. It manages to do so without making the modem unusable in interactive applications. Racal-Vadic calls this unique mode of operations "Dementin Durber."

tion "Dynamic Duplex." In real-world use, the 960VP felt like a 1,200-bps modern when used in interal-world use and the state applications. While this wasn't nearly as nice as using one of the true V.32 moderns, it was better than some of the slower asymmetrical or ping-yong types. Dynamics to Duplex would work better or a modern to Duplex would work better or a modern does on the 960VP, which drops all the way down to 1,200 bps. In our lines tests, the Racal-Vadic managed to get good throughput.

error correction. The result is a modified version of the public domain MNP Class 3 protocol that resends only those blocks that have data errors. Racal-Vadic's resulting "Superset MNP" protocol should give better throughput on noisy lines, since MNP also resends all the blocks sent after

the data block that contains the error

NO COMPRESSION Unfortunately, Racall-Vadic didn't include data compression. This pats the 9600VP at a disadvantage when compared with the other pseudo-full-duplex moderns. 9600VP users can partially make up for this by compressing files with readily available utilities like ARC and PKARC or by using a communications program like HyperAccess, which

In addition to the Hayes AT command set, the 9600VP also supports Racal-Vadic's own auto-dial commands and can store up to 15 telephone numbers. In Vadic mode you can even link stored numbers so

performs its own compression.

■ HIGH-SPEED MODEMS

the modern will dial number 13 if there is no answer to a call to number 2. You can't mix commands from the two command sets, so flags-like clear-to-send (CTS) handling or auto-answer on-set in Vadic mode remain set in AT mode. You can even enter Vadic mode commands from the ten-button front panel. This could come in handy for people with dumb terminals, but PC software usually makes these features superfluous.

The 9600VP's low-profile cabinet includes LEDs for transmitted and received data; error correction, high speed, clear to send (CTS), data set ready (DSR), data terminal ready (DTR), ring indicator, and carrier detect in addition to the front-panel switches. The LED in the answer button displays the modem's auto-answer status. Racal-Vadic has also realized that computer people use power strips, so its designers put a cord on both sides of the line transformer so it would take up one outlet.

Even though the 9600VP has been on the market for some time, Racal-Vadic sent us an early production model for testing. Current production units, unlike our sample, may not have the wire-wrap wire and chips with pins in the air. However, the 9600VP's manual showed no rough spots. A rarity in modern manuals, the 9600VP's is technically complete and readable. It even includes a few words on using the 9600VP with PCs and popular PC communications packages including Crosstalk, Carbon Copy, and Close-Up.

Even with Dynamic Duplex and Superset MNP, the 9600VP is only a fair performer when compared with the rest of this group. Perhaps the promised 9600PA with 2,400-bps Dynamic Duplex and data compression will be better.-Howard Marks

TELEBIT CORP.

TrailBlazer Plus

With its TrailBlazer, Telebit Corp. offered one of the first high-speed modems in the PC market. The TrailBlazer Plus is the company's attempt to hold its place in the fast lane of telecommunications

The original TrailBlazer was notable for both its quick file-transfer time and its slow character-turnaround time. Now two generations later, the Telebit TrailBlazer Plus has all but eliminated the old cumber-



Sticking to a straightforward design, Telebit's TrailBlazer Plus has a black pebbled casing with only an LED display to one side of the front panel.

some turnsround problem

During character-tumaround tests, the modern managed 122 milliseconds-making it second only to the Hayes Smartmodem among non-V.32 modems. In actual use, if you type fast enough, you can see



(415) 969, 38(0) List Price: \$1,345 Requires: All necessary materials-including cable-are contained in the package. In Short: The TrailBlazer Plus yielded the fastest file-transfer speed of any modern on a clear line. It also offers reasonably good compatibility with the original Haves AT command set. Unfortunately, as shown on our noise tests, performance deteriorates rapthe screen falling one or two characters behind your typing, then catching up in bursts. This lag, however, is not slow

enough to be a problem The modem's file-transfer time is still noteworthy. Part of the "Plus," in fact, is a newly added data-compression scheme.

On PC Labs tests over a clean line, the TrailBlazer Plus managed the fastest time of any modern tested. But while its 1.538character-per-second speed is only slightly faster than that of Ven-Tel's Pathfinder, be aware that Ven-Tel uses the same protocol as the TrailBlazer (having licensed it from Telebit). The next fastest modem is the Courier HST, at 1,248 cps. Not so incidentally, the TrailBlazer and the Pathfinder are the only two modems from different manufacturers that can talk to one another at high speeds.

MISLEADING TEST RESULTS The figures for the Xmodern and Mixed tests are, unfortunately, misleading. To begin,

idly on marginal lines

WHOLLY KAO.

The diskette. The whole diskette. And



the TrailBlazer has special modes for Xmodem and Ymodem, and for Kermit transfers. When the modems are set for the appropriate protocol, each modem sends its local computer the acknowledgments required by the software before going to the next packet.

■ Be aware that the TrailBlazer is not fully Hayes-compatible. Its extended commands have little in common with those of the current Hayes Smartmodems.

In effect, the high-speed modems use Xmodem, Ymodem, or Kermit protocol between modem and computer—but they use their own proprietary protocol between modems.

For the protocol support to work, both moderns must be set properly before establishing communications. We had to ignore this feature because in PC Labs tests there was no way to stop the file transfers and reset the moderns.

Alas, the TrailBlazer also does not hold up over noisy lines. While the modern maintained respectable speeds in all cases where it worked, it gave up completed when faced with an average amount of noise on a worse-than-average line. More importantly, these were conditions under which all but one other modern continued to work.

This result was surprising, since the TrailBlazer monitors line conditions and adjusts transmission speed to accommodate changes in conditions. The fallback/fall-forward scheme is supposed to adjust speed in increments of 100 bits per second at a time.

Interestingly enough, Ven-Tel's Pathfinder—the TrailBlazer's licensed cousin—maintained its speed far better on the noisy lines. NOT FULLY HAYES-COMPATIBLE
Be aware that the TrailBlazer is not fully
Hayes-compatible. Like the Hayes Smartmodem 9600, it stores all settings in nonvolatile memory. But its extended commands have little in common with those of
the curnent Hayes Smartmodems; instead,
the TrailBlazer uses a superset of the origimal Hayes commands. A useful discussion
of the differences between the TrailBlazer
and the Smartmodem 1200 can be found in

the installation guide. During tests, the TrailBlazer had no problems with Crusstalk XVI or Crusstalk AVI or

One thing the TrailBlazer does share with the Hayes Smartmodern 9600 is its speed of negotiations. Establishing a link with another TrailBlazer took roughly 12 seconds—enough that you may need to adjust your communications program so that it won't timesout.

In addition to using its high-speed mode, the TrailBlazer can communicate with other modems at 300 bps using Bell 103 protocol, 1,200 bps with Bell 212 and V.22 protocol, and 2,400 bps with V.22 bis. At low speeds (2,400 bps and below), the TrailBlazer offers support for MNP Classes I through 3.

Selling for \$1,345, the TrailBlazer of fers an acceptable mix of features and performance for the price. But based on PC Labs noise tests, it's a hard one to recommend over the slightly slower Ven-Tel Pathfinder. Under most conditions, the Telebit TrailBazer should perform well. On marginal lines, it may run into problems—M. David Stone.

UNIVERSAL DATA SYSTEMS UDS V.32

When V.32 modems parade into the PC marketplace in a big way, the UDS V.32 is likely to be leading the band. The least expensive V.32 modern reviewed here by far, this \$1.595 unit approaches the price



of the proprietary high-speed modems.

The modem's physical design alone leaves little doubt about how the company would like to sell this modem. Measuring 99½ inches wide by 11 deep by 3 high, the UDS V.32 is large by PC standards but notably small by data processing standards. What's more, he two-tone gray and off-white colors match your PC or AT exactly, giving the look of a shrund-down, distant cousin. Put it on top of your PC, and the UDS V.32 will look right at both 100 SV 3.23 will look right at both 200 SV 3.23 will look ri

More important, the modem's claim to a place in the PC market is hardly a superficial one. Of all the V.32 modems reviewed here, the UDS modem is the only one that makes a serious attempt at Hayes compatibility.

SOME INCOMPATIBILITY
Entylade for review had some minor incompatibilities with the Hayes
Smartmoderns—primarily in default settings that differed from Hayes's. Accordings to UDS, these problems have been fixed, and the version being shipped at this
writing is fully compatible with the Smartmodern 2400. (If you received the early
version, you can get a free upprade.)

The claim of full compatibility isn't strictly true, but where there are differences, they make good sense. The Smartmodem's AT B command, for instance, chooses between V.22 protocol and Bell 212 protocol at 1,200 bits per second. This isn't an issue for the UDS modem, which

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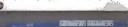
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Universal Data Systems' UDS V.32 has a two-line alphanumeric LCD, three push buttons, and six LEDs on its front panel. There is one cooling vent toward the back.

only uses V.32 protocol and only operates at 4,800 and 9,600 bps. For the UDS modem, the ATB command chooses between 9600-Trellis-coded, 9600-uncoded, or 4800-uncoded modes.

One potentially more troublescome incompatibility, however mine, is the compatibility, however mine, is the compatibility, however mine, is the to resert to frost-panel buttons to switch to resert to frost-panel buttons to switch from a voice call to a data call. When the Hayes Smartmodern, you simply the toper. With the UDS modern, you have to push the Talls/Data button on the frost panel to the Talls/Data button on the frost panel on the many commitment to the Hayes command set, I was assume set, I was assumed to the things of the modern set of the top of the modern set. I was assumed to the top of the modern set of the modern set of the modern set.

As a practical matter, the UDS is compatible enough for most propatible enough for most proparam—though you'll have to adjust your software's time limit for dialing, (It takes 22 seconds to establish a link after the modem picks up the plone.) The UDS V. 32 worked without problems with Pro-Comm, Crosstalk MA. Relay Gold, and Crosstalk XVI, but I could not get it to work with Smartcom III Suuto-dial feature. CHANGEABLE SETTINGS As with the Smartmodem, all settings for the UDS V.32 are held in nonvolatile memory and can be changed through the AT commands. For those who prefer talking directly to the modem, the UDS also offers

control through its front panel. The panel includes a two-line, 16-character LCD, which provides an interactive menu for changing modern settings. Two buttons allow you to move through the menu and change settings as needed. When not displaying the menu, the LCD shows the modern status; idle, talk (the phone can be used), training (neegoldating a

link with another modern), and on-line (the link is established).

The front panel also features six status lights, plus the equivalent of four more that you can optionally show on the LCD. Badly missing is an auto-answer light—the only serious design oversight in this unit.

The user manual is good by any standards, which is extraordinary for a class of modern that is usually sold to the data processing market. But it does have its gaps. Although the manual does a good job of

explaining how to use the modem, it gives almost no background information. A typical example shows the message "Far end echo Level=__dis" and explains it as "Displays the largest far end echo level detected." Here again, UDS is aware of the problem and is planning to revise the manual to make it more appropriate for the PC market.

On the PC Labs tests, there wasn't much to distinguish one V.32 modem from another. Where there were differences, however, the UDS V.32 was the best in each case—with a slightly faster character-turnaround time and slightly faster transmission in Xmodern. On the moise tests, the UDS performed just like all the other V.32 moderns, unaffected by everything that we could throw at IV.

Clearly, there is much to like about this modern and not much to dislike. It is less expensive than other V.32 moderns, performs equally well or better, and is far better suited to the PC market. And although the lack of data compression makes it slower than some nonstandard moderns, its V.32 protocol does a better job at surviving poor line conditions. If you're in the market for a full-legeld, full-ulput-gloud, full-ulpu

U.S. ROBOTICS INC. Courier HST

data direction as needed.

U.S. Robotics has long had a history of trying to outdo Hayes by offering modems that promise just a few more features at a somewhat lower price. The Courier HST, which sells for \$995, continues this noble tradition.

Like most high-speed modems, the Counter HST uses its own combination of data compression (MNP Class 5), error checking (a modified version of MNP), and modulation protocols. In this case, it uses an asymmetric scheme whereby data flows in one direction at 9,600 bits per second and in the other at 300 bps. The modems automatically switch the hist-speed

And as is typical of high-speed modems, the Courier HST can't talk to anyone else's modem at high speeds. However, it can still talk to other modems at 300 bps with Bell 103 protocol, 1,200 bps with



The LED display on the U.S. Robotics Courier HST covers almost the entire front panel. One large row of cooling vents stretches across the top. DIP-switch settings are printed on the bottom.

Bell 212, or at 2,400 bps with V.22 bis, which covers the most common possibilities. In addition, V.22 protocol at 1,200 bps is expected to have been added by the time you read this.

On performance and features, the Courier HST is intriguingly close to the Hayes



Courier HST

U.S. Rovaise Inc.
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fers roughly the same performance as the Hayes Smartmodem. The combination of price plus features, added to the predominance of the Courier HST on BBS systems, makes this an attractive choice. Smartmodern—slightly better in some ways, slightly wore in others. The Courier, for example, takes about 6 seconds to establish a connection—about half the time it takes the Smartmodern. But the Smartmodern has the quicker charactertunaround time—just over half the time of the Courier. In each case, the added time of the slower modern is not enough to be a problem, but it is enough of a difference to be noticeable.

SPEED TESTING On the PC Labs Character Turnaround test, the Courier HST scored near the bottom of all moderns tested, 84 ms. slower than the Hayes Smantmodern and 150 ms. slower than the leader, the Gandalf Access Series V-32. On the Xmodern test the Courier Staff fared about average, ahead of four other moderns. But then, none of these moderns is designed to be used with the Xmodern or the Ymodern protocols.

The Courier's performance on the noise tests was also noteworthy. On relatively noise-free lines, the Courier did better than any other modern tested. With average EDITOR'S CHOICE

. IIDS V.32

If you have no urgent need of a highspeed modem, you may want to wait a few months. It's likely you'll find newer products on the market, and you may be able to better determine which one the international standards seem to be forming around.

Among the high-speed modems we reviewed, the \$1,595 UDSV '3.2 we reviewed, the \$1,595 UDSV '3.2 we reviewed, the \$1,595 UDSV '3.2 wanded earn it an easy Editor's Choice, but there is one drawback to it: the IDSV '3.2 does not offer low-speed modes or error crection. If you need those features; you may want to look at one of the pseudo-full-dublex modems.

Among that group, three are worthy of consideration. The Hayes V-Series Smartmodem 9600 is expected to gain wide acceptance: it comes from the standard bearer of PC modems. The U.S. Robotics Courier HST is receiving a glowing reception from computer bulletin board SysOps and is notable for its MNP Class 5 support in the lowspeed modes; finally, the Ven-Tel Pathfinder 18K performed well in PC Labs tests, and its Xmodem, Kermit, and UUCP features could be useful to anyone who must use communications software that doesn't properly support highspeed modems

noise levels, it still ranked among the best. Interestingly, with noisier-than-average lines the Courier gave up, under conditions where some other moderns—including the Hayes—could still maintain a connection.

This last result comes as a surprise, because the Courier has a fallback capability intended to help it maintain a connection on poor-quality lines. According to the manual, the modems monitor the quality of the line during 9,600-bps communica-



















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tions, and they are able to automatically downshift first to 7,200, then 4,800 if needed. If the line improves, the modems automatically shift up to the next higher speed. In our tests, the modem dropped the connection entirely.

The Courier HST uses DIP switches to control some of its settings—the single bank of ten switches being easily reachable on the back of the unit. Be aware that the Courier's DIP switches control some settings that the Hayes Smartmodem controls through software. If you don't know your way around terms like DTR (data terminal ready) and CD (carrier detect), you may have some trouble setting up the Courier HST with your favorite program.

SETTINGS MARKED For users who feel comfortable with DIP switches, a nice touch is that the settings are clearly shown on the bottom of the modern, along with a list of all the modern commands. This ensures that you'll be able to change your modern settings long after you misplace your manulan and quick-reference card.

For Hayes compatibility, the product is better than some moderns, but if is not perfect. In addition to using DIP switches, the Courier has a substantially different set of extended commands than does the Hayes Smartmodem family. Although there is some overlap, there is far more that is different.

During tests, the Courier managed nicely with Crosstalk XVI, Relay Gold, and Crosstalk Ms.4—but not until after the DIP switches were set for CD and DTR. The modern also did not work properly with Smartcom III's or Smartcom IIII's auto-dial functions.

One other consideration for those who busherselves downloading from bulletin boards: U.S. Robotics is actively targeting BBSs as a market, selling the modem to sysops at a discount. And indeed, on the lists we've seen at PC, there are many more BBSs using the Courier HST than any other high-speed modem.

Certainly, the Courier HST manages respectable performance at an attractive price. Though it wasn't the best performer on PC Labs tests, its combination of price, performance, and predominance on bulletin boards may well be enough to every your decision.—M. David Stone.

VEN-TEL INC. Pathfinder 18K

Ven-Tal's Pathfinder 18K was one of the fastent modern in our test group-sceially when sending less-compressible data patterns like archive (ARC) in the Pathfinder uses the unique multisarre PEP (Packetted Ensemble Protocol) technology developed by Telebit for their TrailBlazer moderns. Ven-Tel has licensed this technology from Telebit. As a result, TrailBlazer and Pathfinder moderns can exchange data at their full speed of almost 18,000 bits per second on a clean to 18,000 bits per seco

The Pathfinder's multicarrier technology allows it to make the most of the telephone network's limited bandwidth. Since cach carrier transmits only 200 characters per second, the Pathfinder can fall back in 200-cps increments rather than the more usual failback from 9,600 bps to 7,200 bps and 4,800 bps. On PC Labs tests, it began to lose performance as lines became noisier, but it continued to send when all the others save us.



dled everything we threw at it with aplomb.

Particularly interesting are the special Xmo-

dem and Kermit modes.

CIRCLE (M7 ON READER SERV



Ven Tel's Pathfinder I.K has a conventional design in an aluminum casing, his from panel has several LEDs—including some bicolor ones that can glow either red or green.



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gotiation process is accompanied by a cacophony of beeps and squacks since the speaker disconnects from the phone line at the end of the process. One SysOp that uses the TrailBlazer calls it a "bug zapper" since the negotiation tones sound just like one. Calling a Pathfinder with a lowspeed modem takes an especially long time because the Pathfinder tries to make a high-speed connection before attempting a low-speed connection. If you will have both high- and low-speed callers, make sure the low-speed callers set up their systems to handle the long connect time, or they may give up just as the connection is being made.

COMFORTABLE FIT The Pathfinder is significantly smaller than the TrailBlazer. Its aluminum case fits comfortably under a standard desk telephone. Its front panel contains several LEDs-including some bicolor LEDs that can glow either red or green. These bicolor LEDs are covered with clear windows that from the wrong angle make them appear lit even when they are not. Ven-Tel has shown great wisdom in supplying the Pathfinder with a transformer that has cables for both the modern and AC sides of its connections. PC users rarely have room on their power strips for those huge combination plug-transformers and would willingly pay an additional \$2 for a transformer with a cord.

Besides the PEP high-speed protocol. the Pathfinder supports the 300-bps Bell 103 and the 1,200-bps Bell 212, as well as the CCITT V.22 and the CCITT 2,400bps V.22 bis protocols for lower-speed communications. MNP Class 4 is supplied for communications in any of the lowspeed protocols.

One unique feature of the Pathfinder (and Telebit's TrailBlazer Plus) is its ability to imitate protocols normally used with communications software while still using its own, more-efficient error-correction scheme between the two modems. When using this protocol, your PC will send data to the Pathfinder using the Xmodem, Kermit, or UUCP (UNIX-to-UNIX Communications Protocol) protocol. Then the modem will respond to the computer as if it were the other end of the communications link. At the same time, the modem strips One unique feature of the Pathfinder is its ability to imitate protocols normally used with communications software while still using its own scheme.

off the protocol overhead and sends the data across the phone line using its own error-correction scheme.

At the other end, the other modem builds Xmodem packets and sends them to its computer. This method ensures computer-to-computer error checking-not just for the modem-to-modem link. It also avoids the additional overhead of running two error-correction protocols at the same time. This speed improvement can be significant: you'll find the method especially handy if you're using the Kermit 8th-bit quoting feature for communications with mainframe computers.

The Pathfinder supports the basic Hayes AT command set, but many of the extended AT&T commands are not supported. Those functions are supplied via additional S registers. Ven-Tel is clearly targeting the PC market with this modern. and the readable manual includes directions on using the Pathfinder with popular communications software such as Crosstalk XVI

The Pathfinder is a quality product and should be considered for any point-topoint communications need. On the other hand, it seems unlikely that Telebit technology will become the industry standard, so users looking for long-term public highspeed communications might want to pass it by.-Howard Marks

Howard Marks is an independent systems consultant and free-lance writer based in New Jersey M. David Stone is a contributing editor of PC Magazine.





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RELATIONAL DATABASES: TAKING THE MIDDLE GROUND

Relational database programs which might better be called "mulhave taken over the great middle ground of the PC DBMS software market.

Even among those users whose needs can be met with single-file (or flat-file) database programs like the 24 products reviewed in the previous issue of PC Magazine, the comparatively powerful, flexible, and difficult-to-use relational programs are in wide use.

At the same time, the PC database software market has clearly fragmented these relational products into two categories: (1) those that, by including a programming language, allow construction of complex systems, linking many steps, often under menu shells written for those systems in that programming language, and (2) those that, by personal computer standards, are unquestionably relational yet do not offer a programming language and thus provide Straight relational databases are in a market squeeze, threatened by more-powerful

more-powerful flat-files and a growing number of easy-to-use programmable databases. less flexibility and tool-making potential. The latter, however, may instead offer such rewards as speed, economy, and ease of use

So we have divided relational PC databuse programs into those two groups with and without integral programming languages. In this issue you'll find reviews of nine PC DBMS programs sans language; in the next issue look for reviews of 43 more relational databases, all with their own programming languages.

MULTIFILE RELATIONALITY Few terms in the personal computer lexicon are so widely misused as the word relational

so widely misused as the word relational, and few PC topics are so widely misunderstood as the idea of relationality in database programs. Indeed, those of us who develop, self, program in, and use relational databases on PCs use the term very differently than do those working in the minicomputer and mainframe worlds. Among PC users, relational database has come to mean "a database that can draw information from more than one file at a time."

Thus, when Wayne Ratliff wrote the pioneering Vulcar while working at Caletch's Jet Propulsion Lab, then helped turn it into one of the best-selling PC his to Statemens Asthon-Tate's BBASE II. then BBASE III—the program was tagged as "relational" because (in the BBASE II version) it could gather data from a munificent two files at a time. That may be barely relational, but relational it is, in the PC definition of the term

And when Wayne Erickson wrote RIM (Relational Information Management) to tackle problems with Bocing's beat-shield tiles on space shuttles, then founded Microrim and published for PC users another big hit product called R-base (based on RIM), it was called "relational," too, since it could draw information from many files.

In the big-iron world of minis and mainfranes, relational means a lot more than merely access to data in multiple files. (See the sidebat "Beyond Nextness" and Trackiness.") But whether or not PC database programs meet the tests for relationality applied to product developed for larger computers, the ability to open and use data from several files at once to answer a user's query, or print a report, is an immensely cowerful idea.

And that idea has come to lie at the heart of PC database management.

CLOSE "RELATIONS" The means used to link, or relate, the data in those sev-

eral files gives rise to the term relational.
Imagine all the data in each file forming
a table, with column headings for categories of information and each row consisting of the information available in those
categories for an entry in the file. Now
imagine that we create "relations" among
those tables—ehared information that allows us to associate table I with table 2, iatows us to associate table I with table 2, ia-

ble 2 with table 3, and so on.

That, in PC terms, is a relational data-

When we turn to the database to answer a query—for example, "What was the date electricity was connected to the house at 1104 Maple Street? Who is responsible

for paying the utility bills for that address and how can he be reached? And what is the current balance due on the account?"—the DBMS program uses these relations to search successively through several files, gather the necessary information, and present it on-screen or in a printer

report. One file might be a customer-namesand-addresses file, one might be a historyof-service-by-address file, and one might be an accounts receivable file. The customer file and history-of-service files might be linked by the common relation, or filed, street address, and the customfile and the accounts receivable file might be linked by the common relation common file and the accounts receivable file with the common file of the common non-relation between the history-of-service file and the accounts receivable filebecause the DBMS program would connect them through the first two links.

DBMS WILDERNESS? In examining the division of relational DBMS programs for PC: into these with and without integral programming languages, it's striking how many of the best-known and most-widely-used relational database programs has on what earlierly solid, along paramning languages, in a way, our middle group of DBMS programs without programming languages may be one way to becoming a norman's-land, a kind of database wilderness or man's-land, a kind of database wilderness.

It's being squeezed from below by sophisticated single-file DBMS programs such as Raphd'ile, Q&A, and PFS-Professional File, which increasingly include such big-time data management features as data typing and verification.

data typing and verification.

If the greates benefit of these relational programs in the middle is seen as ease of use, they're also being squeezed hard from above—by such easy-to-use products as peraduct. And if their advantage is supposed to be lower cost, they're also being challenged by the various "GCLONES," or dBASE-compatibles, such as dBXL, which are often priced much lower than these programs yet positioned solidly in the highest-furnionality group.

Those considering one of these products might thus want to wait and peruse the entries in our third and last installment of Project Database before making a choice. None of which is to say there aren't some exceptionally good programs in this middle rank.

DBMS POWER PowerBase, for example, has been an Editor's Choice in previous Project Database comparisons and removariant programming the properties of the PowerBase Po

That's how those users new to computers thought they were supposed to work; it's a "gee whiz!" feature that endlessly delights users in its simplicity and direct ness. It also demonstrates why savvy database users might well choose a program from among this group, rather than one of the better-known titles in the programma-ble-relational group.

So why isn't PowerPlaze better Known? Formerly published by PowerPlase Systems, the program languished for a while during a critical period of growth and development in the PC database market. For a long time, for example, PowerPlaze didn't support the subdirectories and PATHing added to MS-DOS in DOS 2.0. That developmental lethargy gave other, perhaps less-capable programs a head

Eventually acquired by Compuware, a respected Detroit-based vendor of mainfirame software, PowerBase has been substantially updated and is once again getting the kind of support that it and its users have deserved. It remains one of the best-designed, most-usable database programs available.

PEACE, LOVE, AND DATA Sequitur (a text-oriented database, and for that reason on reviewed here) is another old-timer that has continued to stay alive and grow in the face of the avalanche of advertising and publicity for better-known products like MRASE and R-Ause. It was godfathered by Lee Felsenstein (also principal designer of others in Berkeley's Community Memory Protect durine the hevday of the (Community Memory).

At last getting organized is painless with Nutshell Plus



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What's needed is a database for the rest of us Imagine that instead of creating a monstrous single file of data, you can create logically linked files that pull related data from one to another, saving you time and keystroking, and preventing errors from redundant data entry. You don't have to program, but you can create macros.



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BEYOND "NEXTNESS" AND TRICKINESS

Thoughts on "relationality" from a founding father.

Our sloppy use of the term relational pains Ted Codd. And well it might. For what Dr. Edgar F. Codd—ex-IBM scientis, now president of the Relational Institute and chief scientiss of Codd and Date International, an eminent consulting firm—wrought with his "Relational Model" was nothing less than a revolution in how we think about storing and managing data on computers.

has been a second to the control that is the c

Unfortunately, Codd would say, it's been less rather than more.

been less rather than more. Codd kieled or a lot of common Codd kieled ap lot of cod sign of common codd kieled application of codd kieled application of codd kieled codd kie

The first echoes the mathematician's "operational closure" rule. In arithme-

tic, for example, if an operator operates on numbers, what you get back are . . . numbers. Not oranges or Chevrolets or asteroids, but numbers. By the same to-ken, Codd insists, when a database operator command) operates on a table—and the concept of all data represented as two-dimensional tables is central to the relational model—what you should get back is a table.

Not, as some programs produce, something different from and fundamentally less powerful than the tables in which the data is stored.

Codd argues that very often when we turn to a database with a query, we don't know yet exactly what it is that we want to know. "When we extract data from a database, we often don't know what's there, and so we function like a detective." Codd says. "We ask questions which lead to other questions. Much like the detective, we don't know what we're after 'ill we set some leads."

Thus the process of querying the database and getting an answer should help us see what it is we really need. It should also provide what it is we really need. It should also provide what by necessity are only intermediate answers in the form of new tables, upon which we can one again perform an operation. Otherwise, programs return lifeless answers; if the answers are not what we may now realize as were seeking, they cannot be used the basis for further, more-precise inquiries.

Put more formally, every command in a truly relational system takes relations as operands, and produces relations.

as operands, and produces relations.

Codd also argues for the importance of the structure of those tables in which data is stored by a truly relational pro-

gram. Those tables must have no duplicate information (indeed, in a relational database passing Codd's tests, no data is ever duplicated); we must be able to reorder rows at will, without affecting the data's integrity; and likewise, we must be able to shuffle column headings without losing data.

To build tables that function otherwise, Cold argues, relies on the contentwise, Cold argues, relies on the contentor of "mextress," or a specific order to the rows or columns of data—that is of hard retard. The different and which next after that, and which next after that, and which next after that—an inherent flaw in every database designed before the relation and model. Getting away from what Ted Cold dlikes to call "tricky ways" of "livinky ways" of hadding data—such as ordering row—is at the heart of the relational idea.

The relational model, after all, is intended to produce a uniform interface that everyone from data administrator to data clerk to corporate executive can readily understand and use. Needing to know about and deal with structural variations built around "nextness" destroys that consistency and ease of use.

max consistency and case of use:
Despite his years at IBM and the company's recognition of his contributions,
Codd gives IBM—and virtually every
other DBMS vendor—poor grades for
fully adopting the relational model in
current products. In Part 2 of this explorration of Codd's work and model, with
will appear in the next issue, we'll look at
how he evaluates many of the betterknown database programs, from mainframes to PCs.

A hint: that big best-seller you're thinking of doesn't fare very well. —Jim Seymour

er) Power to the People movement.

The Community Memory project grew out of a desire by Felsenstein and his cohorts to diffuse the power of the computer widely through society. With Berkeley as a rich and fecund testing ground, the plan

was to distribute terminals throughout neighborhoods, so Everyman might tap the power of centrally stored databases. The focus on terminals and shared logic was soon overrun by the rapid advance of the powerful, freestanding personal computer, and today, when we look back, the populist zeal of those Bay Area hobbyists and crusaders may seem quaint to some.

But no one who looks at Sequitur can fail to respect the exceptional work done by Community Memory in developing the

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Eva Nohra, Drake International, Toronto, Ontario

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Allention Government Buyers: MSC products are listed on the GSA sched

program. Felsenstein likes to joke that the product was named Sequitur so that when innocents asked "Why that name?" he and his colleagues could exclaim, "Because that means all the others are non semitins!"

Whatever the inspiration for the name, the product remains interesting, a bit quirky, and very powerful.

SQUEEZED IN THE MIDDLE Perhaps your database management needs can be handled with one of the higher-end flatfile programs reviewed in the previous issue, in the first part of Project Database. Perhaps they can only be met with the power and flexibility of one of the programmable relational products coming up in the next issue.

But although the relational programs without integral languages hold an evershrinking middle ground between those groups, don't write them off too soon.

For example, WordPerfect Cosp.'s new DataPerfect (which was scheduled to be released late in January, after press time), has powerful links to the company's top-selling word processing program, WordPerfect, which make mail list management at same DataPerfect will be most useful to those using WordPerfect, but that includes a lot of coole.

At best, new introductions to this market are bringing unique solutions to business problems. If nothing else, the programs reviewed here are survivors.

—Jim Seymour

Jim Seymour is a contributing editor of PC Magazine.

Cornerstone

Infocom has packed a respectable number of features into its \$99.95 relational data-base, Cornerstone, Version 5.21. While it can't compete with high-end packages, the program certainly has an edge in the low-prica market, where most products have no relational capability.

As you might expect from a vendor that has made its mark with interactive fiction, Infocom has provided a very attractive user interface for this program, combining menus with a command line. You create a string of commands either by typing the

OUR REVIEWERS

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first few letters of each command and pressing the Spacebar to fill in the rest automatically, or by selecting commands from a menu just below the command line. At each stage, you're prompted for the next command; a new menu then presents your available options. If the command

string must include the name of a file, field or set of saved criteria, the menu will present you with all the appropriate names you've created.

To make things even easier, there's

context-sensitive help that incorporates the names of your files and fields into its messages. An excellent interactive on-disk tutorial will help the novice user get started.

The documentation is quite good. Although it neglects to provide instructions for making the program self-booting from a floppy disk, you will probably want to run it from a hard disk (as with most databases). An Al is also advisable for Corneratore, since it's a sluggish performer on an 8088-based PC. Even screen scrolling and cursor movement are agonizingly slow on the less powerful machine.

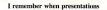
Convertions provides a good range of options for data entry. There's automatic range testing, and you can specify default values, mandatory fill, and unique certics. The program understands such orities as Today. Next Monday, and Last Month praine date. You can also specify a list of values from which you must select high a particular field; you can then type only the first few letters of the value and base of the value and base from which you must select high in the rest. If the first few letters of the value and base provides automatically fill in the rest. If the value and base pressing the value of the value and base pressing 15 will allow you you grow crossing.

Another nice feature lets you designate a field as a subrecord, which can contain a number of subfields. Creating subrecords within a file can provide an easier alternative to creating two separate files and linking them relationally.

For the sake of simplicity, Cornerstone relies heavily on on-screen forms. To select records, you enter your selection criteria after the appropriate field names in a blank form. Using AND or OR specifications, you can link several forms to perform Boolean operations.

If you wish to change the way your data is displayed, you're presented with anothor blank form representing a record. You can then use the cursor to move fields around on the form or change their display lengths, hide field names, and add fixed text. And for later use, you can save numerous different display format or selection forms.

FILE LINKING AND REPORTING Cornerstone is somewhat limited in its relational capabilities. You can view or generate a report on only one file at time. If you wish to view or use information from



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one file in the context of another, you must link the files, create some new fields in the first file, and then specify that the values in these fields are to be derived from fields in the second file. On the positive side, you have a good assortment of math, financial, time, and date functions at your disposal for deriving values from different fields.

In other areas, too, Comeratione often forces you to go about things in very award ways. If, for example, you decide to transfer last year's records from your active file to a new file, you fe in for a cumbersome process. You must select the records you wish to move, save the selection criteria, export the file to ASCII format using the saved criteria, import it under the new filename, and then delete the redundant records from the original flow of the original form the original flow.

To perform a global update on a text field, you must select all the records containing the string you want changed, assign the replacement string as a default value for the field you want to update, and then issue a recompute command.

Cornerstone has fairly limited reporting capabilities. To define a report, you must select the records you want, sort them, define the display format, then calculate totals and subtotals—each time waiting for one procedure to finish before beginning the next. You can save report criteria for later use, but you must store selection, criteria separately from the other election, criteria for later.



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This is not a program for handling very large databases, although it can process files containing up to 32,700 records. After watching Cornerstone devote 3 hours to importing a 30,000-record ASCII file and nearly half an hour to sorting it, we gave up on running the remaining PC Labs tests on the largest file size.

If you need to generate complex reports or work with Jung numbers of reach control or work with Jung numbers of reach control or or work with Jung numbers of reach control or the control of the control

Enrich

Eartch, Migent Software's nonprogrammable database manager, is described by its vendor as "the business applications generator." While the temputation may be product's true value lies somewhere between those extremes. It is a very good forms generator. But its lack of a procedural language procludes its classification as an applications generator.

an applications generator. The market Migent claims to be targeting is the small-business end user, and the
sing is the small-business and user, and the
tion work well toward that end, if small
business also means small application.
The profile of this purchaser would involve limited exposure to DOS or other
peakages, a form suproach to a given
problem, and limited application complexity. The buyer who fits this profile will be
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and corresponding database:

Migers never lost sight of its intended
market when designing the Enrich mantuals. The documentation is lean, concise,
and logically arranged—as far as it goes,
The "Read This First" packet neatly orients and directs the reader to the rest of the
ents and directs the reader to the rest of the
stallation manual. These exercises on the
booklets: Tutorial, Reference Guide, and
Anolications Manual

The Tutorial walks the user through the formatlatabase development process, taking a step back to over some basic hardware/DOS concepts. Lessons cover topies starting with the creation of a formidatabase, proceeding with revising and reporting on a form, and then moving on to more-advanced topies like sharing information among several forms and doing calculations based upon situations and conditions.

There are some shortcomings in the Reference Manual. It does not have its own index, but instead is referred to in the Tutorial index. The examples supplied for the middling to advanced topics are not sufficient, and the procedures are unclear. This lack of depth will be finstrating for any user who decides to venture beyond simple amplications.

simple applications.
What's worse, we experienced a lot of trouble getting help from the technical support staff at Migent. To be unable to perform fairly simple tasks because help is unavailable in any form soured our impressions of what might be an outstanding product in its class—it is hard to judge a function you cannot nerform.

The third booklet, which has its own floppy disk, is the Applications sampler. If you find forms that are similar to the ones you need, the sampler will be particularly helpful; otherwise, it is useful as an adjunct to the tutionial.

There are other elements in Enrich deigned with the end user in mind. The on-



MULTIPLE DATABASES AT A GLANCE



If you wish to alter the format for displaying your records, Comerctone presents you with a form to edit. To change the position of the selected field (indicated in reverse video), you move the cursor to the new location and press Enter.



Extich's sample report for merchandise return allows implementation of averaging and record counts as well as some date functions. The H and F in the left column stand for header and footer material: D stands for detail.



Files & Folders' help screen includes an explanation of the current menu and a description of each available function.



Goldatabase's Manage Database screen is where all the action is, including adding, modifying, searching, and printing records.



You can temporarily sort on all of the fields in your Nutshell Plus database. You can then undo the sort quickly with menu commands or save it permanently by exporting the data to a new file.

line help is context sensitive and refers the user to specific manuals and pages for more information. The menu-driven, screen-painting approach in this package is also suitable for its intended user.

FORMS AND FUNCTIONS It is easy to create and modify forms on the screen. First you lay out the prompts and the fields, along with any borders you want. You can further define the fields, including the type of information they hold (character, date, numeric, or dollar), the origin or source of the fields' data, which file should be updated by the information entered into the field, the appearance (intensity, underline, blink), patterning (such as a phone-number convention), and other miscellaneous field characteristics.

There are some other nifty things that Enrich will do, such as changing the screen characteristics of a field depending on the value of that field. If, for instance, you want the data entry person to be aware of a negative balance upon retrieving the record of a particular client, you can set up the form to show the field in a reverseblink mode if the value is less than zero.

There is also a windowing function that allows you to work with several forms at once. The system assigns field names internally and then allows you to refer to them, change them, or not use them at all, simply pointing to a field during any field definition function.

One glaring limitation is the lack of a browse or zoom function; unless you prepare a report, the only way to view the data in your files is one at a time. Also, within the reporting function there is no simple way of automatically including all the fields in a particular form. The absence of these two factors makes viewing more than one record at a time a cumbersome chore. This is not in keeping with an otherwise clearly defined strategy of making Enrich a tool for the unsophisticated end

Another unreasonable limitation: Enrich will not allow you to sort on a number field in descending order. At some point in most users' relationship with the program, this refusal is bound to frustrate.

Enrich's lack of any programming capability precludes the development of a complicated application, but the product

was not designed with that use in mind. As a low-priced tool for the low-key end user, it is a valuable, easy-to-master tool. If you expect your needs to grow beyond the basics, however, Enrich will be a source of disappointment.-Kate Emery

Files & Folders

Looking for an inexpensive database program with a slick user interface-one that's powerful and fast, has relational capabilities, and has been around long enough to prove its worth in the marketplace? If so, take a good look at Files & Folders, Version 1, 17, from Starcom Computer Corp. In a nutshell, F & F is an intelligent, electronic filing cabinet. It is not programmable, but it offers some powerful data validation, math, and relational functions as well as password protection at

the file level To install F & F on a hard disk, copy the Program disk and, optionally, the Tutorial disk to the hard drive. The first time F & F starts up, it prompts you for the type of monitor you'll be using and the location of the key disk (if needed). The copy-protected version uses the Program disk as a key disk, which has to be in Drive A: or B: whenever you start up the program. For an additional \$35, the copy-protected F & F can be exchanged for a non-copy-protected version, provided your registration card has been sent in.

F & F comes with an on-disk tutorial as well as a "Getting Started" tutorial section in the manual; both tutorials give a clear understanding of the program's basic functions. The on-disk tutorial can be run interactively or automatically as a demo.

All F & F commands and menus are accessed via function keys F1 through F8. with a different menu displayed at the bottom of the screen for each level of the program. During program execution, keys that aren't used for the current menu choice are disabled-a nice touch for novice computer users and those of us who make a habit of pressing the wrong keys.

F8 invokes one of many context-sensitive help screens. These explain the overall function of the current menu and briefly define each selection available from this menu. A page number supplied on each help screen cross-references the manual.

And for additional help, Starcom offers unlimited free technical support to all F & F users. However, there is no toll-free number

PROGRAM PROCEDURES Data files in F & F are set up in "folders" that contain "boxes" (fields) and "labels" (field prompts). Each folder contains one data file, and up to 30 folders can exist in one "cabinet" (directory).

F & F uses the concept of "picture programming," whereby all the fields for a data file are painted on a data entry screen. Setting up a database definition is easy. Boxes, representing fields, are placed on the entry screen, given names, and assigned data types. Math equations can be set up for numeric fields, and text addition equations (concatenation) can be performed on text fields. F & F lets you test the equations with sample data before saving them in the folder definition.

Sort-key fields (indexes) can be created for each field while you are defining the database structure. These fields provide a fast and efficient method of searching for records and are also used to link separate databases. F & F sets up a binary tree for each sort-key field, so, unlike index files in

FILE

FACT



but they can lead to limitations in database size and importing speed. Copy protected (non-copy-protected versions available) CIRCLE 664 ON READER SERVICE CARE

■ RELATIONAL DATABASES

Relational Databases: Summary of Features

(Products listed in ascending	Cornerstone \$99.95	Goldetebese \$149.95	Superbase \$149.95 (with GEM), \$99.95 (without GEM)	Enrisb \$199.00	Xirieve \$245.00 (plus \$245.00 for Btrieve)	Files & Folders \$295 00	Nuishell Plus \$295 00	Power@ase \$349.00	Universal base Sis \$395.00
leatelled program size (kilobytes)	242	654	166	166	1,694	349	425	13.000	818
Mie. no. of program files	2	2	3	1	8	3	1	25	2
FILE STRUCTURE LIMITS									
Size of a 5,000-record file (kilobytes)	694	570	1.050	1.050	745	349	1.050	990	624
Field size (byles)	4.000	80	255	200	256	78	Unlimited	80	80
Fields per record	158	300	Unlimited	300	256	125	Unlimited	64	Untimited
Fields per database	18,960	300	Untimited	3,600	256	375	Unlimited	Unlimited	Unlimited
Record size (bytes)	3,500	16,000	Unlimited	4,096	Unlimited	1,404	Unlimited	1,500	Unlimited
Records per data file	32,700	Unlimited	Unlimited	Unlimited	Unlimited	65,000	Unlimited	65,534	Unlimited
No. of data flies per detabase	120	1	999	12	Unlimited	3	1	64	Uelimited
DATA FIELD TYPES AND MAXIMUM SIZES									
Character Heids	● (255 bytes)	● (80 bytes)	● (255 bytes)	• (200 bytes)	(1 byte)	● (78 bytes)	(Unlimited)	(80 bytes)	● (80 bytes)
Long text Helds	● (4,000 bytes		0	0	0	0	(Unknited)	0	0
Nemeric fields	 (255 bytes) 		(13 bytes)	 (15 bytes) 	(8 bytes)	● (78 bytes)		 (15 bytes) 	 (80 bytes)
Currency fields	(255 bytes)	0	(13 bytes)	(15 bytes)	(2 bytes)	0	0	• (17 bytes)	• (80 bytes)
Data fields	 (255 bytes) 		(6 bytes)	(2 bytes)	(4 bytes)	• (10 bytes)	(10 bytes)	 (10 bytes) 	• (8 bytes)
Time fields	 (255 bytes) 	● (10 bytes)	0	(2 bytes)	(4 bytes)	(8 bytes)	0	(8 bytes)	0
Baolean fields	 (255 bytes) 	0	0	0	(1 byte)	(1 byta)	0	(3 tytes)	0
Other fields	0	0	(TK bytes)	0	0	● (78 bytes)	• (250 bytes)	0	(80 bytes)
DATA FIELD ATTRIBUTES						-		-	- The same
Tests for valid data ranges	(automatic)	(user-defined)	(user-defined)	(user-defined)	0	(user-defined)	(automatic)	(eser-defined)	(user-defined)
Provides defacti values	•	•	•	•		0	•	•	0
Checks for spesific values	•	•	•	•	0	•	•	0	•
Verilles data via a lookes table	(user-defined)	(user-defined)	(user-defined)	(user-defined)	0	(usar-defined)	(automatic)		(user-defined)
	•	•				<u> </u>	•		•
Provides outomatis date entry from tookep toble	0	0	0	(user-defined)	0	(user-defined)	(user-defined)	(user-defined)	(user-defined)
Doeble-entry verification	0	(user-defined)	(user-defined)	0	0	(user-defined)	0	0	0
Regulres all fields to be filled		•	•		0	•			
	(user-defined)	(user-defined)	(user-defined)	(user-defined)		(user-defined)	(automatic)	(user-defined)	(user-defined)
Offers "forced appercase" option	0	0	0	(user-defined)	(user-defined)	0	0	(user-defined)	0
Converts dale formats	(automatic)	(user-defeed)	0	0	0	0	0	0	(automatic)
Increments fields	(user-defined)	(user-defined)	0	(user-defined)	0	Outer-defined)	0	0	(user-defined)
Uelque fields	(user-defined)	(user-defined)	(automatic)	(user-defined)	0	(user-defined)	(automatic)	(user-defined)	(user-defined)
Fixed values for data entry fields	(user-defined)	(user-defined)	(user-defined)	(user-defeed)	0	(user-defined)	(user-defined)	0	0
Calculated Stelds on entry sarrees	· Control of the cont	CorrSpecial	(ext. symital	· Street	0				
Corryover from previous reserd		Ö	ō	Ö	ŏ			•	•
	(user-defined)	-	-	_	_	(user-defined)	(automatic)	(user-defined)	(user-defined)
Error handling	(automatic)	0	0	(automatic)	(sutematic)	0	(automatic)	(automatic)	(automatic)
Data dictionery/catalog	•	(user-defined)	Outer_defined)	0	(automatic)	0	0	(automatic)	(user-defined)

DATA IMPORT EXPORT	Coreerstone \$99.95	Goldelebese \$149.95	Seperbose \$149 95 (with GEM). \$99.95 (without GEM)	Enrich \$199.00	Xtrieve \$245.00 (plus \$245.00 (or Strieve)	Files & Folders \$295.00	Nntshell Ples \$295 00	PowerBase \$349.00	Universe base Sis \$395.00
Dif	•		0	0		0	•	•	•
DRF		d	0	•	8	0	•	•	0
PFS	•		0	701				•	10
SDF	•	0	0	•	•	•	0	•	•
SYLK	0	0	0	0	0	0	0	•	0
WKS		0			0	0		•	
ASCII								•	
User-defined		•	•	U	•	•	Ö	U	•
DATA MANIPULATION									
Max. no. of indexing Belds	Unimited	20	Unimied	23	20	25	Unimited	6	5
	None	80	None	5	20	7B	Unimited	None	15
Mex. no. of compound Indexes Unionn index value	None	0	Sene O	0	0	/B	Unimined	None	13
Respective indexed Helds				•					:
			10:						•
Actometic index maintenance	•	•		•	•	•	•	•	•
Respectly tile definition	•	•	•	•	•	•	:	•	•
Meltiple record deletions	:	•	:	:	:	G.		:	•
Multiple record epdates		•	•	•		0	Ü		•
Math apdates	0	•	•	•	•	0	0	•	•
Tout appoints	•	•	•		•	0	0	•	•
No. of view fables	1	None	None	None	255	None	Unimited	None	Unhmiter
No. of join tebles	None	None	None	None	8	None	None	10	Unlimiter
No. of naion tables	None	None	None	None	None	None	None	10	Un'imiter
No. of append febles	None	None	None	None	None	2	1	2	Unhmiter
Mrx. no. of open defa files	8	1	5	12	None	3	1	10	12
SORTING									
Permanent	•	0	0	•	.0	•	•	0	•
Temporary (for denation of command)				•				0	
Sorts on any finid		•	•	•			•	0	
Sorts on Indexed field only		•				ō.	00		•
No. ef fields sorted at once	Unlimited	20	Unlimited	5	20	78	Unlimited	N/A*	5
SEARCH PARAMETERS									
First occurrences	0	0			0	•	•		0
All occurrences									
Meltiple fields (mes. no.)	in .				● (20)	0	5		• (65)
mempre notes (meet new)	-	(Unlimited)	(Unionited)	(Unlended)	• 1117	-		(300 character	1}
Case-sensitive	0	0	•	0	•	0	0	0	0
Whale word		•	•		•		0	•	
Value or character range	•	•	•	•	-0.	•	•	•	•
Wildcard or string segment	•	•		•	•	D	6	•	•
Nnil character search	•	•			•	0	0	•	
Bealenn	•		•	•	•	•	•	•	•
Compound Boolnen	•	(3)			•	•	•	•	•

■ RELATIONAL DATABASES

كالمحط	Corneratione \$99.95	Geldulubuse \$149.95	Superbase \$149.95 (with GEM), \$99.95 (without GEM)	Enrich \$199.00	Xtrieve \$245.00 (plus \$245.00 (or Btrieve)	Files & Foldurs \$295.00	Nutshelt Plus \$295 00	Power Base \$349.00	Universal base Six \$395.00
QUERY FACILITIES	10.000					\$295.00			
Deery by exemple								•	•
Query by torms	•	•		:	0	•	•		.01
Multiple file occess Query editor sepport		0		d	8	20	101		
Stored quaries						· ·		:	
MATHEMATICAL FUNCTIONS				•					-
Data arithmatic	•				0	0			
Time arithmetic		13	101.				13	8	
Arithmetic tenctions								•	
Exponential functions	•		•	O.		•			•
Trigometric tenctions			•	0.	Di		00		13
Financisi functions	•		CI.			0		0	
Aggregate functions									
Totals	•	•	•	•	•	•	•	•	•
Subtotals	•	•	•	•	•	•	•	•	•
Average	•	•	•	•	•	•	•	•	•
Count	•	•	•	•	•	•	•	•	•
Maximum	•				•			•	
Minimum	•		CI		•		0	•	D
Other	•	O	0	U	•	O	Ü	•	Ū
STATISTICS									
Stundurd deviution	•	0	0	0	0	•	0		
Verlance	•	0	0	0	0	U	0	0	0
COMMAND STRATEGY									
Static menus	•	•	•	•	0	•	•	•	•
Dynamic menus	•	•	•	0	•	•	•		•
Typed commands	•	•	•	0			(0)	•	
Segport moese	0	13	•	d	•	•	3	•	D)
MACROS									
Automutic recording	D	0	0	0	•		•	0	
Keystroke macro	0	10	0	0	•	0		0	
Macre lunguuge	U	•	0	0	•	0	U	0	0
INPUT FACILITIES		_						_	
No. of screens per life	1	10	Unitmited	1	1	1	Unimited	1	Unimited
No. of littes per screen	1	1	1	12	8	3	1	1	12
Screen delinition									
Peinting	•	•	0	•		•	•	•	•
Coordinates specification				(3)	•	(0)			
Automatic held-nams placament	•	0	•	0	•	0	•	•	•

OUTPUT FACILITIES	Corecratoree \$99.95	Goldwinbase \$149.95	Superbese \$149.95 (with GEM), \$99.95 (without GEM)	Eerich \$199.00	Xtrieve \$245.00 (plus \$245.00 for Btrieve)	Files & Folders \$295.00	Nutshell Plus \$295.00	PowerBese \$349.00	Universat base Six \$395 00
Multiple lile reports	N/A*	Uelimited	3	5	8	3	Unlimited	5	Unlimited
Page breaks	•	•			•	•	•	•	•
Breeks whee fields chaege	•	•	•	•	100	•	•	•	•
Report delinition method									
Paieting	•	•	di	•		•	•	10	•
Forms duplication	•			•		10	•	•	•
Automatic	•		•		•	.03	•	•	•
Predefined mailing labels			•	•		0.		•	
Stored report definitions	•	•	•	•	•	0	•	•	•
Line-besed	•	•			•	•	•	•	0
Form-besed	•	•	•	•		•	•	•	
Custom	•	•	Ū	•	U	•	•	•	•
DOS SUPPORT									
Chaega detault directory		0	•	•	•	•	•	•	0
Access from another directory	0_	0	•		•	•	•	Ü .	0
SECURITY									
Pesswords for databases	0			•		•		•	•
Pesswords for files		•	•	•	•	•		Ū	Ū
SPECIAL FEATURES									
Application generator	0	0	0	•	0	0	0	0	•
Meeu geeerator		•			•				
USER SUPPORT									
Cost of telephone support	Free	Free	Free	Free	\$200\year	Free	Free	Free	30 days Free, thee \$150/year
Autometic oe liee hetp	•	•			•	•	•	•	•
Tutorial	•			•		•		•	0
Prompt messages		0			0		60		

Now that there's an IRMA put your old ideas about m

PC Coordinators have been debating the viability of Macintosh to mainframe links for a couple of years now. With opinions varying from impeccable to impossible.

But no matter what ideas you might have

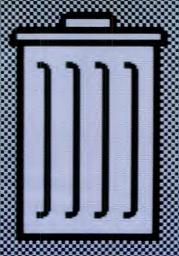
on the subject, they are now old ideas.

Because DCA has introduced MacIRMA**

Because DCA has introduced MacIRMA And all the reliability and ease of use that made IRMA"the PC-to-mainframe industry standard has come to the Macintosh II™and Macintosh SE.™

How does that help you? Well, MacIRMA can support the DCA and IBM' mainframe file transfer software that you probably already have installed in TSO, CMS and CICS environments. Allowing you to actually offer

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for the Macintosh, you can ainframe links in their place.

your users a choice of either Macintosh or IBM microcomputers while maintaining consistent 3270 connectivity. And you can offer the same training and

support to each of them regardless of which microcomputer they choose.

What's more, MacIRMA's 3270 emulation software is a true Macintosh application.

It works with a "mouse," pull-down menus, is compatible with Switcher and Multifinder programs, and supports "copy-and-paste" to incorporate mainframe data into word processing or spreadsheets. And that igust for starters. For the whole

And that's just for starters. For the whole story, call DCA, toll-free, at

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many other database programs, the sort keys are always maintained. You must be sure, however, to create all your sort keys when you set up your database; otherwise, you'll have to revise the folder and transfer all the records from the old copy to the new copy in order to build a new sort key (binary tree).

Data can be output using a List & Sort command that lets you list any fields and any records, using specified criteria, to a workspace area in RAM. Once the fields are in the workspace, you can add or delete rows; sort the data; add breaks on fields; insert subtotals, totals, and calculations; and print the data to a file or to a printer. But if you're dealing with a large data file and the records won't fit in the workspace. you also can create a customized report. The report writer allows you to include a report header, page headers and footers, up to five levels of breaks, and a report summary. Unlike List & Sort, a report definition can be saved and printed at any time.

Besides single-file functions, F. & f. and provides Remote Floder Functions that allow you to fink up to three databases relationally by a common sort ley. Remote Folder Functions canable you to search for corosts in different remote folders and save data to and from them. Completely automate, these functions are saved with the database definition—which makes managing a relational system extremely opening other folders for remote updates or even multiple-file lists and reports or even multiple-file lists and reports.

Password security is allowed at the database (folder) level. Users can be given Save. Write, or Revise access to folders.

SIZE AND SPEED F&F is remarkably fast. Of course, the binary-tree sorting method contributes to the speed of data retrieval, but you'll also notice that screen updates are unsually speedy. This is because the program writes directly to video RAM, bypassing DOS along the way. Data is updated in real-time mode, and there are no preliminary steps involved, in other words, what you see on the screen is what's stored in the data file.

A couple of things to watch out for when creating database structures are the size of the sort-key fields and the number

of keys. These two factors directly affect the maximum number of records allowed in a folder and the speed with which data can be imported to a folder. The larger the binary tree files are, the fewer records can binary tree files are, the fewer records can can be read into a folder. If you have between 20 and 25 characters combined in the sort keys, for example, you will be able to enter only between 20,000 and 30,000

necords.

F & F is a flexible and easy-to-use relational database manager, with many powerful functions available without the hassle of complicated commands and routines.

These benefits make the program ideal for nul users and for anyone who wants to stay away from programming.

—Greg Alvaser.

Goldatabase

Goldatabase, from Goldata Computer Services, stands out as a simple-to-use, menu-driven database with some advanced data management features. But several shortcomings, however minor, keep it from proving a leader in its class.

Although Goldatabase can be run from floppings, a hard disk is recommended for best performance. Installation is a snag: you simply execute a batch file that copies your program files to the hard disk. To keep things simple, the program doesn't require changes to your CONFIG.SYS file.

Goldatabare merges the creation of the database and that of the data entry screen into one process. At the blank Screen Definition screen, you simply paint your input form as you would like it to appear. By entering certain characters (# = numeric, % character, and so on), you define the location and the field type. Typing &&&&&&&, for instance, will create a date field at that location on the input screen.

Goldatabase allows for numeric, integer, character, date, and calculated fields. Since you can have up to ten screens per database, a field can be defined as displayonly in case you want to display the same field at the too of each screen.

To spruce up the data entry screens, Goldatabase makes it fairly simple to draw single- and double-lined boxes around part of the screen or all of it, if you like.

Any field you create can be defined as keyed, for fast access, or mandatory (to require a value to be input). You can define further edit criteria to be enforced during data entry, including range checks and list verification. You can also create a lookup verification of a field in another database. Product numbers entered on your sales order screen, for example, could be verified against your inventory file. To perform this verification you must have matching field values (such as product numbers) in each database. It was frustrating, however, to be unable to display data from another database on my current screen without actually adding that data to my current database.

DATA MANAGEMENT The Manage Database module of Goldanabase is where the action is. Here you perform your data input, searching, printing, and data exporting. From a command line, you can enter one of 23 commands to perform the operation you desire, to save some typing, the ten most commonly used commands are available through the function keys.

Goldatabase displays the command associated with each function key on the last line of the display. As you are learning the commands, you may want to use the program's help function: type F1 and you'll see a point-and-shoot type menu of all the available commands. As you select a





Pelational databases are expected to be nore robust than their flat-file counterparts. They should be able to handle larger files and be more sophisticated in the way they go about it. For this reason, PC Labs eloped a suite of tests to measure their strength while manipulating a 50,000-record file. None of the programs reviewed here, however, could perform those tests. The programs either were unable to import the 50,000-record file within the allotted 3 hours or, once the file was imported, were unable to perform any other tests within the 3 hours allotted for each. In fact, Xtrieve took almost 8 hours to import the 50,000-record test file and Nutshell Plus took more than 10 hours. In examining the results reported here (for lests on smaller files), you should consider that good programming in a relation database should result in a product that manipulates records more quickly as the size of the data file increases. A given test

should not take 10 times as long to process 5,000 records. 5,000 records as it takes for 500 records. Cornerstone, for example, performed well on the Delete and Index test, where it took no more time with 5,000 records than with 500 records. But on the same test, Universal base Six took 265 times as long to process the 5,000-record file as it did for the 500-record file as it did not the 500-record file as it d

record file.

The Import lest measures how quickly the database can import an ASCII file (of either based-field length or commesitivitied formal) with an index on the filest field. We included he indusing portion of the test to acid possibility programs that automatically index the first field during the data consertion. Some content of the content for making the content for the content of the content for the content formation and the content of the content for the content formation of the content of the content for the content formation of the content of the content for the content formation of the content of the content of the content for the content of the

version. Some programs required a live-step process for this lest an emport followed by redearsg. The Estracet lest measures the time it takes the program to estruct the fields from the database and send them to a FAMation on to the screen. As part of the procedure, the DBMS was also required to sort on one of the fields and select fields that matched one specified criterion. We out-

printer performance on a factor in the timed results.

The Sext test measures the time it base for the package is out the file on a unindemed field in according order.

The Two Table Report test generates a report for those records whose year" field in equal to 1886 or 1890. The report is made up of 10 fields and is sorted (in according and decording order) on 20 files field, in expending and decording order) on 20 files field. The test calculates and so sorted on according and decording order on 20 files field. The test calculates are sorted on the calculates and sorted on the calculates and sorted on 20 files field.

total at the and of the report. The resulting file is sent to a FUMdesk.

The Search test measures the time it takes to locate the first record that satisfies two onlens (make = Fendix and model = coupe).

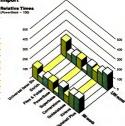
The Test Update lest measures the time necessary to

The Text Update test measures the time necessary to search for and replace a specified test field. The Delete and Indiax test measures the time required remove two columns (Units and SelfPrice) from a Product

The Pack/Rebuild test reflects the time spert regaining disk space lost during the Delete and Index test and rebuilding the index less spore lost during the roles regrame automatically pack are rebuild the distallates after deleting and indexing; for these

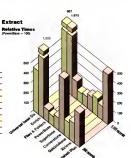
project lour fields—Tean ... No. Units. SelfPrice, and Tran-Date.—from the test distablese into a new table or database, and then to index the first field. Some prices were listed on \$0.00, only those records for which the SelfPrice was creater than that amount were projected.



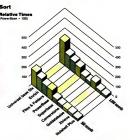




Performance Times	Extract				
(Times given in seconds)	500 records	5,000 records			
Universal base Six	47.98	829.35			
Enrich	166.00	1,657.00			
Files & Folders	13.40	153.00			
PowerBsse	11.00	84.00			
Superbose	14.06	94.00			
Cornerations	62.00	123.00			
Goldstabass	16.00	148,00			
Xirieve	21.70	115.31			
Mark Mark Co.		100.00			



Performance Times	Sort			
Times given in seconds)	500 records	5,000 records		
Universal base Six	101.51	1,511.61		
Enrich	84.00	880.40		
Files & Felders	64.80	742.00		
PowerBase	84.00	642.00		
Superbase	30.22	304.00		
Cornerstone	21.00	226.00		
Goldatabase	20.00	448.00		
Xiriere	18.67	194.65		
Notabell Plas	13.10	150.40		

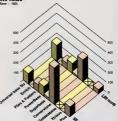


Two-Table Report

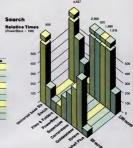
Relative Times (PowerBase - 100)

Performance Times	Two-Ta	ble Report
Times given in seconds)	500 records	5,000 records
Universal base Six	60.72	1,011.43
Earlich	N/A*	NA*
Files & Faiders	40 30	387.00
PowerBase	57.00	643.00
Superbase	14.70	124.00
Cornerstone	210.00	1,407.00
Goldatabasa	N/A ³	N/A [†]
Xtrieve	N/A ²	N/A [†]
Muichell Plus	57.80	289.75

N'A'-Not applicable: program was unable to complete this test within the allotted



erformance Times	Search				
limes given in seconds)	500 records	5,000 records			
Universal base Six	17.12	241.84			
Earlch	4.00	23.00			
Files & Folders	2.00	12.80			
Powar8asa	2.00	5.00			
Superbase	4 50	115 00			
Cornerstone	6.00	46.00			
Goldstebuse	8 00	74.00			
Xtrieve	10.72	95.93			
Hutshell Plus	1.20	10.20			

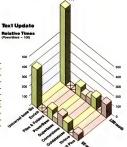


EVA.

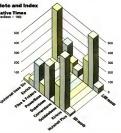
Benchmark Tests: Relational Databases

Performance Times	Text Update				
Times given in seconds)	500 records	5,000 records			
Volversal base Six	53.81	898.18			
Enrich	N/A [†]	N/A [†]			
Files & Felders	N/A [†]	N/A [†]			
PowerBase	14.00	116.00			
Superbase	7.20	60.00			
Corneratone	17.00	77.00			
Goldatabese	13.00	132.00			
Xtrieve	N/A [†]	N/A ¹			

N/A*—Not applicable: program does not have this feature



Performance Times	Delete and Index				
(Times given in seconds)	500 records	5,000 records			
Universal base Sis	10.48	2,994.79			
Enrich	33.00	256.00			
Files & Felders	139.00	1,417.00			
PowerBase	53.00	592.00			
Superbase	180.00	361.00			
Cornersions	8.00	8.00			
Goldstabase	114.00	1,424 00			
Xirieve	289.90	3,061.44			
Metchell Plus	10.60	290.00			

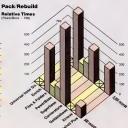


Performance Times	Pack	Rebuild	
(Times given in seconds)	500 records	5,000 records	
Universel base Sis	N/A [†]	N/A ¹	
Enrich	N/A ¹	N/A ¹	
Files & Folders	57.00	622.00	
PowerBese	13.00	110.00	
Superbese	17.30	168 00	
Cornerstone	100.00	352.00	
Goldetebase	N/A ¹	N/A [‡]	

N/A1

Nutshell Plus 13.87 287.20

N/A*



erformance Times	Project Sales Table				
limes given in seconds)	500 records	5,000 records			
Universal base Str	102.26	1,666 42			
Enrich	N/A [†]	N/A*			
Files & Folders	37.90	375.00			
PowerBase	87.00	911.00			
Superbase	20.71	299 00			
Cornerstone	98 00	873.00			
Goldetzbase	N/A [†]	N/A [†]			
Xtrieve	115.15	825.72			
Nutsheli Plus	N/A*	N/A ¹			

Relative Times

Project Sales Table

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■ RELATIONAL DATABASES

menu choice, the help function walks you through the options available for that com-

mand. Searching for information in the database can be performed in two ways. For novices, Goldatabase provides a queryby-forms option, much like that of PFS:File. For experienced users, a Find command can be entered on the command line. Either search method can perform equal-to, less-than and greater-than queries as well as substring searches using the

Contains option.

Compound searches using the Find command are performed in multiple steps. For example, to search a database for "name = Smith AND city = Boston." you would enter a Find command that

searches for Smith. Goldatabase creates a selection set consisting of only those records found in the search. Your second Find command will search only the records found in the selection set-not the entire database. Though the actual retrieval time is impressive with this method, you do spend additional time entering two Find commands instead of one.

REPORT CREATION Creating reports in Goldatabase is virtually painless. Like the input screens, reports are created by painting the image of a report on the screen. Fields included on the report can be from the current database or "mapped" in from another database. Unfortunately, you are not able to perform any calculations on fields mapped from secondary databases. Reports can be outputted to the screen, printer, or text file. Much to my frustration, however, I was unable to freeze output being sent to the screen.

(Even Ctrl-S didn't work!) In addition to the report function, Goldatabase provides a form module where you can quickly design forms for output. This facility is extremely useful for creating form letters with fields from your database inserted into the proper locations. One problem lies in the editor provided for creating your letter, which contains few basic word processing capabilities such as word wrap. For more-graphically-oriented forms, you can draw boxes around sections of text or include other graphics in the document.

The documentation is short and

sweet-perhaps too short. Goldatabase uses very few examples and practically no screen layouts or graphics to assist in explaining functions. A tutorial disk walks the new user through the basic database functions.

Goldatabase is for users who do not want to spend a lifetime learning a complex database. For \$149.95, Goldatabase contains a lot of functionality for your dollar. If you can live with some minor shortcomings, you're likely to be pleased. -T.J. White

Nutshell Plus

Nutshell Plus is the latest addition to Nashoba Systems' line of relational databases. But it's more than just an enhancement of Nutshell-Nutshell Plus packs quite a few features of its own into a small nackage.

Nutshell Plus is shipped with a program disk, utilities disk, and a tutorial. You can run it from the program disk, or you can create a subdirectory and copy the floppy disks onto your hard disk. The hands-on tutorial gives you a good overview of the package.

In the first screen, the program requests the name of a file to open; only one file can be open at a time. Once you've entered the name, Nutshell Plus moves to the working screen, which has two lines at the ton for status information and two at the hottom





Nutshell Plus. Nashoba Systems Inc. 175 Sudbury Rd. Concord, MA 01742 (617) 881-7404

List Price: \$295 Requires: 384K RAM. one disk drive (two floppy disk drives or hard disk recommended), IBM PC or compatible or IBM PS/2, DOS 2.0 or later. Package in-

cludes both 51/e- and 31/e-inch disl In Short: A simple relational database with file linking, sorting, and flexible layouts for screen design and report generation. Not copy protected. CIFCLE 602 ON READERSEIN/OF CARD

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■ RELATIONAL DATABASES

for commands, menus, and messages. The rest of the screen serves as a work area.

Much as in Lotus 1-2-3, menus are arranged in tiers. You use them in one of two ways: you can use an All-key and the first letter of the choice, or you can type F2, select the choice with Tab or cursor keys, and hit Return to execute the command. An escape at any menu level returns you to the next higher level.

You set up your entry fields using the Define command and specifying the field name along with one of five field types. Besides dates, numbers, and text fields, present the second of t

The power of Natabell Plue lies in its ability to create and modify screen and report layouts easily. You can quickly add a field to a screen layout with the Include function, change the description, and move the field around the screen with carox keys. Each field can be linked to fields in another file, allowing you to verify data as you enter it. You can place text anywhere on the screen and move smoothly from one lavout to the next.

Report layouts can include fields from the current database or linked files along with subtotals and grand totals. You can also create headers and footers with report titles, dates, times, and page numbers. Nutshell Plus supports 35 printers, and you can send predefined codes for normal and compressed output.

DATA MAXIPULATION To limit the database to certain records, you used that see the records using no limit of the active screen layout form. Early offer microst such as ">> 100" in the layout form limit of the active screen layout form. Early offer microst such as ">> 100" in the layout formatis such as ">>> 100" in the layout formatis such as ">>> 100" in the layout formatis such as ">>>> 100" in the layout formatis and act microst fill the expressions. You can use multiple expressions, and can enter multiple expressions, and can enter multiple expressions, and can enter multiple layouts to select "OR" conditions. The Find All function detections the conditions, restoring all the records in the database.



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to your files.

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■ RELATIONAL DATABASES

The Sort function lets you temporarily reorder the file on any fields in the database. You select each field and indicate whether to sort in ascending or descending order; the program then displays and prints records in the current sort order until you select the Unsort function. You can save the sort permanently by exporting the file to a new Nutshell Plus file.

Nutshell Plus can import and export DIF, delimited ASCII, or dBASE II files. and other Nutshell Plus files. An included utility program compresses inactive files and recovers damaged Nutshell Plus files. In addition, a macro capability captures keystrokes and assigns them to function keys or Ctrl-, Alt-, or Shift-key sequences.

The documentation is clearly written, well indexed, and very helpful. The introduction explains Nutshell Plus's approach to databases well, and the manual contains many examples of screens and methods for using each function. The on-screen help messages are succinct but clear, and they show the page reference in the manual for each subject displayed.

Although Nutshell Plus is a dramatic improvement over prior versions, it could still use a few changes. dBASE II was superseded a while ago by dBASE III, yet Nutshell Plus still imports and exports only dBASE II files. While it's nice not having to specify field lengths, the automatic screen layouts overdefine the entry area, requiring modifications to clean them up. All in all, there's nothing seriously wrong that couldn't be fixed in a future version.

Nutshell Plus does grow on you, and you can perform sophisticated tasks if you spend some time using it. It doesn't outshine its competitors with fancy functions and graphical interfaces. It just does well what it says it does .- Mike Falkner

PowerBase

Database management system users often have to choose between ugly, difficult, powerful programs and pretty, easy, weak ones. Compuware Corp's PowerBase, Version 2.3, is a user's program with many advanced features that lets you start with simple files and then get fancier when you need to, without ever having to write a line of program code.

Like most feature-laden programs.

PowerBase can run on a machine with two floppy disk drives but is much more convenient when stored on and run from a hard disk. To install the program on a hard disk you boot the machine with DOS in-

sert one of the five distribution disks in drive A:, and type "a:install". After answering a few simple questions, you just sit back and insert disks as prompted. Depending on your configuration, the in-



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■ RELATIONAL DATABASES

stalled program takes between 1.4MB and 1.8MB of hard disk space.

All operations in PowerBase are controlled either by selecting function options from horizontal bar menus or by using a command mode. In the latter, you select functions by typing one or two letters from the keyboard, entering just enough letters to differentiate the desired command from others available at the time.

Setting up files in PowerBase is fairly straightforward, the only difference from the norm being that you can specify prompt-only or value-only fields if your application calls for them. All files are automatically indexed on the first field defined, but you can deselect that field and maintain indexes on up to six fields per file. PowerBase does not have a sort feature, but indexing greatly quickens selection and search functions.

The only drawback to creating a new index is the time it takes to index a large file, which can be considerable. Record query takes place with either a prompted Query-by-Example method or an equation mode, which is slightly more difficult but offers more flexibility.

In PowerBase, the term application refers to a selection of files that can be related to one another. An application can consist out po to 6 files; each can have as many as 64 fields. A given record is limited to 1,600 characters, with a maximum field reference of the constraint of

POWERFUL FEATURES. The greates "power" in PowerBare is its ability to its files together. While some programs require lengthy and awkward programming to relate one file to another, with Power-Bare all you have to do is hit the "boom" key, choose the file to tie in with the list of home available, select a common for you want to use information street in sepatral ward to the program of the you want to use information street in says left to you want to use information street in says left is a simple matter of pointing and shootine.

Another nice feature among Power-

Base's basic database functions is that you can change file structures at will without joopardizing data. So if you decide that you need two additional fields in a file after it has already been set up and contains thousands of records, the process is easy and safe; once you complete the file redefinition, the old data is automatically trans-

ferred to the new structure.

The program's Powerlinks feature is used to import and export files from other programs. PowerBare can read file structures created by dBASE II and III. Lorus 1-2-3. (Receases 1 A and 2.3.), MultiPlan. VisiCale. Symphony, PFS-File, Multi-Mate, WordFerfeet, and WordStart, as well as DIF and ASCII files. Once a link between data sources has been defined, it can be saved and reused or editled.

PowerBase also allows password protection on the application level. Whenever you start PowerBase, you are asked to select an application to work with. If you don't know the password for an application that bears one, you cannot use that application. You can choose not to assign passwords, and you can change or delete them once they have been set up.

them once they have been set up.

PowerBase accommodates users with different levels of previous experience.

The QuickStarr manual and disk that come with the program give a quick overview of its basic features with an interactive demo. Users with little or no computer experience



MULTIPLE DATABASES AT A GLANCE



One of PowerBase's strongest features is its smooth way of tying files together. This process, called PowerZoom, is all menu driven, requiring no programming whatsoever.



This screen highlights Superb-ne's special "external" file feature.

On the left side of the screen are typical data fields; to the right is an image linked to the record. Note the VCR-like controls at the bottom of the screen.

To make full use of Xtrieve's capabilities, it's best to configure a hard disk drive with separate subdirectories for each type of file created. A data dictionary defines files, as shown above, and the main menu's Configure selection helps you customize the locations of particular file types. the 29-page Overview section, which gram's command mode.

should follow the 10-lesson, 184-page Tutorial section in the PowerBase user mansummarizes the program design, mechanual. The Tutorial section assumes nothing ics, and modules. The 164-page Advanced and is extremely detailed-and even this is Topics section of the manual discusses and divided into levels, offering more practice provides examples of PowerBase's moreon specific functions for those who need it powerful features-such as application debut allowing experts to skip ahead to the velopment; relating (or zooming between) files; linking PowerBase to other programs; password protection; and the pro-

The manual also includes an alphabetical command-reference section, appendixes, a glossary, and a handy cross-referenced index.

Version 2.3 of PowerBase, the package available for testing at press time, does not include a "pack" function to throw away records marked for deletion. This feature

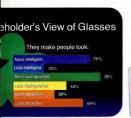


This data entry screen in Universal base Six is filled in for a multiple search on the database. The search facilities are used to find a particular record; the query mode helps in searches that will retrieve groups of records.



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■ RELATIONAL DATABASES

will be available, however, in Version 2.4, due out in early 1988; until then, a utility called PBPACK is available free for downloading by all users from the *Power-Base* Bulletin Board. The bulletin board is

■ PowerBase

accommodates users with different levels of

previous experience.

a convenient facility through which users can keep track of patches, changes, and updates, as well as trading hints and tricks for using the program.

Compuware is still improving Power-Base. But over the years it has not changed

the program's basic strength: giving users a solid tool for building everything from simple files to fairly sophisticated multiple-file applications, all without a need for programming skills.—Bruce Brown

Superbase Personal Relational Database System

Superconductivity, Superman, superson, is, superpower, is that do happen, With Britain-based Precision Software's entry into the American database market (distributed by Progressive Peripherals and Software), wenn bawe Superbase. Occasionally meriting the superlaive, this relatively rue product offere say design, query, and report functions through the use of pop-down means. Its relational functions are workable. And, like the other database programs that are reviewed in this lation.

Superbase is not programmable.

Supervase a fix programmation:

Upon installation, however, System of the Upon fixed him.

Upon installation, however, System only be used in conjunction with a mouse and the GEM windowlike operating environment. If you are unaccustomed to elicking confirm—and opining—you may find it disorienting, cumbersome, and slow. For better or worse, you are required to acquaint yourself with GEM before loading the Supervase region and its. Six disks, the Supervase region and the Six disks, documentation later, you're ready for an introduction to Supervase.

Building and using a database is adminably simple in Superbase. Field definition is accomplished through a series of dialogs. The elaborate array of choices for dat types, sizes, and restrictions (data checking) are logically and visually well presented. The same dialog format is used consistently for virtually all other functions. Making global changes, importing

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ASCII files, simple reporting, and querying can all be executed deftly by the new HSET

More-experienced users can skip much of the slower dialog process, however, by directly typing commands into a window. Nonetheless, the mouse must still be clicked frequently to confirm commands. Once mastered, the command syntax allows far quicker database designing, editing, and querying. Frequently used dialogs or commands can be saved for later use.

Problems emerge when your demands on the program are more sophisticated. Using relational functions and designing complex reports, although possible, is frustrating. A typical relational function such as joining two files involves oblique keystroke combinations only casually mentioned in the manual. All but the simplest reports involve convoluted steps

Furthermore, standard reporting features like multiline headers and footers or

introduction and conclusion fields are absent from the report generator. Overall, the program's complexity of use and its uneven documentation hinder the user anxious to make complex reports and relation-

The documentation for Superbase and GEM consists of a poorly organized and indexed 242-page manual-much of which is filled with needless personal commentary. In a discussion of file design, for instance, one sentence reads, "You may not need or want the former, but you are going to have to gain the latter." The absence of on-line help obliges you to return to this manual often, while the brief and incomplete tutorials leave you curious but uninformed. The last resort is a phone call to the vendor's helpful technical support line. Memorize that telephone number!

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■ RELATIONAL DATABASES

mouse interface and the GEM operating environment, the use of VCR-like controls and multiple views (table, record, form) make this package attractive to the first-time user, (Instead of the usual "end of views and views and

A facility for including large text files and pictures within databases is provided by a linking field. This special external field makes it possible to include images or full word-processing documents in database records. Though not unique, this feature is a useful innovation seldom found in programs of this type.

programs or mis type:
Superbase Professional, a more elaborate version of the program, is due out this elaborate version of the program, is due out this eyear. Its distributors say that it will include improved relational functions—plus programmability. In addition, there are plans to improve the documentation and provide on-line help. No doubt, many of the program's better parts will become more accessible with such improvements.

But for now, Superbase Personal remains an innovatively designed yet limited relational database program. Users intrigued by GEM and attracted to mice will find this DBMS appropriate. Those who intend to build large or complex relational databases would be best advised to wait for Superbase Professional or select another program.—Paul Lang

Universal base Six

While Universal base Six is commonly used as a generic database, it is also used as the foundation of vertical market applications. Over half a dozen products from ASAP Inc.—designed for such applications as bar coding, inventory, and stocknown work—now have Six at their core. Many owners also use it to generate proprietary applications.

This penchant for using Six as an application foundation reflects how simple and straightforward the product is. All its operations are function-key menu driven; its system prompts are clear and complete. And its "relationalness," though somewhat unusual, is automatic. Any number of files can be tapped for reports or queries without doing formal joins.

Six first reveals its unusual relational nature when you design data entry screens. There are two ways to design a screen—

■ Six first reveals its unusual relational nature when you design data entry screens through the automatic or

manual modes.

through the automatic or manual modes. In automatic mode, St lists field items down the left side of the screen, with underlined, blank fields adjacent on the right. In manual mode, fields can appear anywhere on the screen, and you can include text to act as prompts.

ENDEXING POWER The first data item (or field) on a screen is automatically designated by the program as an index. This field can't be unindexed unless you reshiften the field order. In addition, you can have up to four secondary indexes on a screen, and up to 15 for the whole database. The secondary indexes can be changed at any time. In essence, each index establishes a data file. And herein lies the power—and the quirkiness—of Six.

The indexes are used to link data in a dependency relationship. In a given record, all the fields that follow an index field and expendent on it. If there is more field and expendent on it. If there is more index, then each grouping of an index the indexed in the indexed field and its dependent fields is like a subrecord. The secondary indexes can have invalid a subject of the secondary indexes can have invalid a subject of the indexed field walues. The data in the subrecord scan the called up successively searched, while the data under the primary index stay the same finest stay that same finest stay the same finest stay that same finest stay the same finest stay that same finest stay the same finest stay that same finest stay the same finest stay the same finest stay the same finest stay the same finest stay that same finest stay the same finest stay that same finest stay the same finest stay that same finest stay that same finest same finest stay that same finest stay the same finest stay that s

For example, a database record might

have Customer Number as the primary index, with address and telephone-number fields under it. Below those fields could be a secondary index, Invoice Number, with fields of transaction data under it. The part of the record starting with Invoice Number would be a subrecord with many sets of values for each Customer Number.

Being able to nest indexes gives you a lot of power, but it can also lead to befuddlement. If your screen organization isn't well thought out, correcting problems can force you to redesign screens completely, export data to a .DIF or ASCII file, and then import it to the new screens—a pro-

cess you want to avoid.

An index field can also be used in other screens to recall a group of data fields dependent out, and an the same time link the screens together. Then when it comes to be used to the screens together. Then when it comes to the screens together. Then when it comes to specify the fields you want without telling the program what files they are in. This is a much simpler approach than the rignanced or using file questions or programming statements to create a formal join, as is sometiments to create a formal join, as is some the same proper to the programming statements to create a formal join, as is some time to the programming statements to create a formal join, as is some time to the programming statements to create a formal join, as is some time to the programming statements to create a formal join, as is some time to the programming statements to create a formal join, as it is sufficient to the programming statements to create a formal join, as it is sufficient to the programming statements to create a formal join, as it is sufficient to the programming statements to create a formal join, as it is sufficient to the programming statements to create a formal join, as it is sufficient to the programming statements.

Screens don't have to have different primary indexes; if they don't, they are really just other views of the same file. But by creating a number of screen views, you



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can update a file in pieces, which is more efficient than "tabbing" through a large number of fields. Whenever a data field is undated, all the screens and files that contain it are automatically updated.

There is one important downside to the relational approach Six takes: speed. Large files that are split only into screen views

 Novelle's Xtrieve. with its companion program Btrieve, is targeted toward the sophisticated database applications designer.

rather than smaller physical subsets can make some operations-such as queries, extracts, and reports-take an inordinately long time. The same goes for groups of files linked together in a complicated net of interdependencies.

ENTRY AND RETRIEVAL Actually creating the screens or manipulating them is very easy because of the prompts in a dialog box at the top of the design screen. Fields contain text, numbers, dates, or money. They can be up to 80 characters in length

With the screens designed and linked, data entry is just a function key away. In the data entry mode, you can also search the file for particular records. Searches can be for exact occurrences, unknown values (using wildcards), greater than, less than, not equal to, and so on. Because the search criteria are entered directly in the data field, the field has to be large enough to hold the search statement, or else you have to return to screen design and enlarge the field.

Searching is only the first level of data retrieval. By going to the query module in the program, you can view, modify, or delete many records at once. With the query facilities you have the ability to set long, complicated selection criteria using both the AND and OR Boolean connectors. The most sophisticated way to retrieve

data is through custom reports. Data items in a report can appear in both a free-form area and a columnar area. You can add whatever text you want to the free-form area. But this setup doesn't allow for footers. The items appearing in the report can be selected by certain criteria, can be sorted in ascending or descending order, and can include totals and averages. Six produces labels in much the same way it produces reports.

The application-building abilities of Six, collectively called the "process control system," let you order the use of menus and job files you have written with the DOS line editor or an outside word processor.

The next version of the program—due out sometime within the first half 1988-will let you run reports right from the data entry area without having to exit to the report area; I saw a beta version of this capability. An ASAP spokesman also said the next version will be about 75 percent faster, a very welcome and needed enhancement.-Henry Fersko-Weiss

Xtrieve

Novelle's Xtrieve, with its companion program Btrieve, is targeted toward the sophisticated database applications designer. Casual users or small-business owners may find it just the ticket for customized applications, but unlocking the power of this package takes time and a fair understanding of DBMS concepts.

Xtrieve, Version 3.02, is a user-interface application that allows for data entry, file import, query, and configuration using the familiar overlapping menus so common today. Btrieve is the low-level record management software. Included on the disk for Btrieve, Version 4.10, are various C. Pascal, and 8088 Assembler source and object files to provide the applications programmer with access to the Btrieve record management calls.

Running the single-user version requires an IBM compatible with DOS 2.0 or later, with 256K of memory available after DOS, Btrieve, and any other resident programs are loaded. While the system will run on a machine with dual floppy disk drives, a hard disk is recommended since Xtrieve goes to disk often. A hard disk should speed things up; better yet, use a RAMdisk if possible.

Xtrieve comes in the familiar boxed binders and is a snap to install. Make a backup copy and run from the A: drive, with a data disk in drive B:, and you are ready to go. The hard disk install is just as simple. Copy the floppy disks to any subdirectory you wish and bring up the system by typing "xtrieve".

To make full use of Xtrieve's capabilities, it makes good sense to configure the hard disk with separate subdirectories for each of the various types of files that the program creates. The locations of particular file types are defined to the system using the Configure selection from the main menu. Configure also allows the definition of colors, keyboard use, and the various switch settings.

A file is defined to Xtrieve in the data dictionary; to access this function, select Dictionary from the main menu. Here you can create, show, define, remove, reorganize, and set defaults for your database fields. Be careful not to create a dictionary





Xtrieve, Version 3.02 Novelle P.O Box 9802, #917 Austin, TX 78766 (512) 346-8380 List Price: Xtrieve, single-user \$245; multiuser, \$595. Btrieve singleuser \$245; multiuser, \$595 Report Option;

single-user, \$145; multiuser, \$345. Requires: 256K RAM available after DOS. Btrieve, and other TSRs are loaded (Btrieve requires 35K); two disk drives (hard disk recommended), IBM or compatible, DOS 2.0 or

In Short: Targeted toward the sophisticated applications designer, Xtraeve requires much time to unlock its power, even with its smooth user interface. Btrieve, a companion program, is a low-level record manager that includes various source and object files for programmers. Report Option compensates. for shortcomings in Xtrieve's Print command. Not copy protected. CRCLE 676 ON READE

3Com 3+ ON TOKEN RING... **EVERYTHING IBM PROMISED** CORPORATE AMERICA... PLUS.

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internetwork communication between token ring networks at supported speeds up to 19.2K bit/sec. and security that allows only authorized users to access files and data

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hardware are totally compatible with IBM software and hardware. That means you can mix and match them any way you want.

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CIRCLE 238 ON READER SERVICE CARD



if one already exists, for only one can reside in a subdirectory; instead, select another directory from the dictionary configuration menu.

ARRANGING YOUR DATA Xirieve possesses one of the richest sets of data types available in an off-the-sheft package. Augmenting all of the standard types (chuding time and date fields) at 4 and 6-byte floating-point values, as well as both Paccal- and C-type strings. The unsophisticated user, however, may not understand the issues involved in selecting one of the sisues involved in selecting on the program provides little helin.

inthe neighbor and the database either manually or by importing one of three types of files. To enter data by hand is straightforward: just select Edit from the View menu, and the full range of choise are presented. The Add and Modify options are like a spreadsheet. Position the cursor and type.

To import a data file, you simply select the file type and read it into a predefined View corresponding to the file. The only two standard types of files supported by Xtrieve are .DIF and .SDF formats, but

Xtrieve are .DIF and .SDF formats, but you can also read and write an unformatted file. This feature can be a very handy tool for seasoned users.

After you have defined your database to Xrivev and entered your data, simple analysis is elementary. A View or table is created by selecting View from the main menu. A View would consist of a number of your database fields and user-defined fields. Column headings and field masks

can be easily set.

Once your data is in the database, you can query or Restrict your view to a selection criterion. A full range of single and compound Boolean expressions are supported, and restrictions can be saved along with the View for later recall. One major drawbask of the Restrict command—and of Xiriev in general—site back of any predefined statistical, financial, mathematical, or locied functions.

Files can be Joined together in Views using fields from up to eight files. Functions such as creating a new file based on an intersection, not-intersection, or union are not supported. Once you have narmwed the number of records down to the



• PowerBase

With programmable databases becoming easier uses, we think readers should check out the reviews in Part 3 of Project Database, which will appear to nor next issue, before making a part bassing decision. Even flyour re-sumeen who says: "but I don't want to program the thing," you can benefit from the speed and flexibility of programmable database system—and simply ignore

the programming component. Nevertheless, Compuware Corp.'s PowerBase, which lists for \$349, is a product to consider. It is easy to learn. It has extensive reporting capabilities. And, because it supports a wide variety of import/export file formats, it's an excellent link to other programs. PowerBase is ideal for the small professional office where it is unlikely anyone would ever care to learn a programming language. It would also be useful to a corporate manager looking for a desktop database that produces reports and exports files that can later be imported

into a corporate database.

If raw speed is what you're looking for, you may want to check out
Superbase Personal Relational Database System from Progressive
Peripherals and Systems et al.

Systems from Progressive
Peripherals and Systems et al.

Authorized and the entirely and extending the entirely

Relation of the entirely and extending the entirely

Systems and extending the price of \$59.55.

GEM raw time module, you'll poy

no more than the list price of
\$149.95.

desired subset, you can summarize viewed fields. Maximum, minimum, count, and average are supported, and the process to access these functions is simple and direct.

OPTIONAL REPORT PACKAGE Report Option, formerly ealled Reirver, was not provided with the package we removed. The Xrieve Print command will print (to the console, printer, or file) all the fields in all the records in the current View. This is not adequate for serious work, however, and I would suggest you buy Report Option if you purchase Xrieve Report Option if you purchase Xrieve.

port option it you parenase Arrieve.

One major concern for the novice user is the Help function, with which Xirieve does a commendable job. Pressing the standard F1 key quickly activates a full-screen, contextual Help function. And Help can be modified using a supplied utility, a useful feature for small-business applications development.

The documentation is well written but sketchy in places. Good use of examples and screens compensates for the cursory treatment of some topics. A command tree, dictionary structure, glossary, list of error messages, explanation of data types, configuration and customization guide are included in the appendixes.

As may be expected, any command that can be carried out from the menu can be executed from a command file. Xtrieve will record a command stream for later replaying; these Novelle chose to implement as macros rather than as a command file in the usual sense. I found this disconcerting at first, but got used to it quickly. Command files can be recorded, or edited with a text editor, and then recompiled. One of the most useful features Xtrieve offers the small-business person is its well-defined and implemented security. Database, file, and field access are supported for multiple users. Data encryption is supported within Btrieve for the applications developer.

Xirieve reminds me of soda pop. It is tastes good and has a nice package—but when you are finished, the first remains while simple tasks ne easy to accomplish, more-advanced projects may require a good deal of programming experience. Novelte has offered us a product that has a smooth user interface and some interesting features. But it hacks several aspects of a contract that the property of the

COREfast Backup Systems The others just don't stack up.

FLEXIBILITY/SPEED	COREfast	Everex	FastBack	Genoa	Irwin	SY-STOR	SY-TOS	TakeTwo
To avoid learning new programs as your backup needs change, will this system back up to diskatte, hard disk and tape?	YES	NO	NO	NO	NO	YES	YES	NO
Can this disketta based system back up 500 spreadshaet files (8.8MB) in 7 minutas and than rastora them in less than 6 1/2?	YES	NO	NO	NO	NO	NO	NO	NO
Can this tape based system back up 1,500 word processing files (30MB) in 7 minutes and then restore tham in less than 12?	YES	NO	NO	NO	NO	NO	NO	NO
FUNCTION								
Will this system automatically perform up to 8 pre-scheduled backups par day?	YES	YES	NO	NO	YES	NO	YES	NO
Will you be able to save your entire disk without having to select and back up single files at a time?	YES	YES	NO	YES	NO	NO	YES	NO
Does this system contain file-management features which allow you to copy, re-name, view and delata files before backing up?	YES	NO	NO	NO	NO	NO	NO	YES
Will this system save twice as much data per diskette or reduce your backup time through the use of data compression?	YES	NO	YES	NO	NO	NO	NO	NO

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Connection its Editor's Choice, In fact, they called it, "... more than logical - maybe inspired."



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CIRCLE 288 ON READER SERVICE CARD

■ CONNECTIVITY ■

MAKING CONNECTIONS

Two Token-Ring Alternatives

Like the market for IBM PC clones, the market for systems compatible with IBM's Token-Ring Network is heating up. Recovered Proteon have come

up. Racore and Proteon have come out with two new systems. The former competes on price; the latter corrects some of the Token-Ring's flaws.

FRANK J. DERFLER, JR.

compete against Big Blu who
low a few basic rules. Their
products must be cheaper
and/or better. And they must
be as BlM compatible as legaily possible. The competitors to 1BM's Token-Ring
Network that we review in
this article, Racon's LANpue
802.5 System and Proteon's

The technology that allows clone makers to produce products that are compatible with IBM's Token-Ring Network is the Texas Instruments TMS380 chip set. This chip set is certified by IBM as compatible both with the Institute of Electrical and Electronic Engineers (IEEE) 802.5 standard and with IBM's own extensions to the IEEE standard.

ProNET-4, do not stray from

these tried-and-true rules.

Compatibility means that the cards from different vendors should be able to operate on the same network with each other and with IBM. This is important because you may want to add eards from other vendors to an existing Token-Ring network (and because IBM's cards are hard to

When preparing this article, we therefore tested IBM. Racore, and Proteon products together on the same network. We performed file transfers and accessed files in various ways, including the use of DOS 3.1 byte-range-locking calls. We found no incompatibilities or anomalies, although we can't certify that these products will work together under all conditions. Software sensitive to the internal timing and operation of the IBM network interface cards, particularly anything using IBM's Advanced Program-to-Program Communications, do not necessarily work with these clone cards. We tried them under the most common operational conditions, and they did work together.

But while this chip set makes cloning practical, the amount of ingenuity that the vendor uses to promote the chip set is what wins or loses buyers. Racore takes on the market through aggressive pricing. Racore's LANnac 802.5 interface card carries a retail price of \$495, and its hub costs \$395, as compared with \$795 for a comparable IBM Token-Ring card. While more expensive than the IBM system at \$695 for its interface cards and \$895 and \$995 for its wiring hubs, Proteon's ProNET-4 adds value by improving on some obvious flaws in the IBM system.

TOKEN-RING DOSSIER The IBM Token-Ring system is becoming ever more important to corporate Automated Data Processing (ADP) managers because IBM supports an increasing number of Token-Ring interfaces to mainframes. The Token-Ring architecture is an important niece of IBM's Systems Application Architecture (SAA), which is an emerging architecture from IBM that describes how applications should interact with all types of computers. SAA is designed to allow mainframes and PCs to share data on an equal basis on networks. A number of vendors, such as Proteon, also make Token-Ring interface cards for popular minicomputers, allowing for easy interaction between PCs and minis without complex and expensive micro-to-mainframe links and gateways.

IBM representatives took a firm lead in steering the IEEE committee that established the 802.5 standard, which describes the Token-Ring architecture and how a token-passing protocol is used on a network.

The 802.5 standard specifies both the physical and electrical connection scheme for a Token-Ring system. It combines an electrical ring topology, in which every station actively passes information on to the next one in the ring, with a physical hub topology, in which all stations connect to a central wiring hub.

The electrical token-ring access technique uses a single token that circulates among the stations when all are idle. When a station has a pressage to bensivit, it waits

TOKENLINK PLUS: 3COM'S TOKEN-RING ALTERNATIVE

3 Com Corp. was the first company to market Token-Ring alternatives using the TI chip set. PC Magazine reviewed 3Com's Token-Ring network in "Making Connections: 3Com's Ethernet and Token-Ring" (April 14, 1987).

The Tokenl ink Plus, which 3Com uses as its network interface card, uses 16-bit-wide addressing and on-board processing to relieve the communications burden on the server's CPU. We strongly recommend using these powerful 3Com cards (or their Proteon equivalents) in Token-Ring servers if your networking software includes drivers for these adapters. While 3Com does not provide drivers for Novell's NetWare (no. surprise), it does provide a NETBIOS interface. 3Com's NETBIOS interface makes the TokenLink cards interchangeable with IBM's Token-Ring cards running under IBM's PC Local Area Network Program or other NETBIOScompatible operating systems.

The 3Com cards will operate with other 802.5 hardware in the typical physical hub topology. But for 3Com's own Token-Ring system, the company does not clone the IBM wire center or even use a physical hub topology. Instead, it takes the relays out of the wire center and puts them into individual interface boxes near every network node. The interface boxes are connected by a single cable run, a process that saves wire and installation costs since you don't need dedicated runs of wire from each node to the wire closet.

The 3Com TokenLink cards provide another alternative to using IBM's Token-Ring products in a standard 802.5 LAN, and the 3Com TokenLink physical bus architecture provides a completely different way to install Token-Ring systems.-Frank J. Derfler, Jr.

for a "free" token and changes it to a "busy" token. The station then transmits a block of data called a frame immediately following the busy token. The frame contains all or part of the message the station has to send. The frame makes a complete round-trip to all network stations and is purged by the transmitting station, which then inserts a new free token on the ring. During the round-trip transmission process, no other station may send data over the network.

Physically, the Token-Ring network consists of the network interface card, the hub, and cabling to connect the card and the hub. The IEEE defined the functionality and protocols of these pieces, while IBM designed their form and fit. With the physical hub topology used in

the Token-Ring system, every station is connected to the hub by a dedicated cable run. This topology simplifies troubleshooting and helps keep the network running, because a fault in any single cable doesn't bring down the network. Electromechanical relays in the hub bring stations | vided drivers for Nevell's Advanced

into the ring as they initialize their network interface cards and remove the stations from the ring when they shut down.

The major software piece of the Token-Ring is the network operating system. Since the IEEE standard stops short of specifying operating system software, you can run a Token-Ring network with any software containing appropriate drivers for the network interface cards. Networking software companies such as Novell and Banyan Systems provide the drivers for IBM's cards, but makers of token-ring clone interface cards must provide their own drivers for popular networking programs. Usually, clone manufacturers will provide one floppy disk with drivers for Novell's NetWare and another containing a version of NETBIOS to allow the cards to run under programs such as Torus's Tanestry and IBM's PC Local Area Network Program, which talk to the networking hardware through standard NETBIOS calls

Because both Proteon and Racore pro-

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ARCNET scormendon unles de supraining ample Revides being easy to interall, it's tust as easy to add or relocate loss. So you'll never be had could be a contrate againt.

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NetWare, we tested their systems using this operating system.

THE HUB OF ACTIVITY The hub or wire center used in a Token-Ring network, which IBM calls the Multistation Access Unit, is critically important to network operation. It has connectors that give up to eight personal computers or other devices access to the network. The Access Unit fits

 These products from Proteon and Racore are a response to both the successes and flaws of the IBM system.

into a 19-inch rack and has a special cabinet for desk or wall mounting

Because the IBM Access Unit is not powered by the wall socket, you must initialize each port with a hand-held batterypowered device-the No. 8228 Setup Aid-when you set up the system. The Setup Aid properly aligns the contacts on all of the relays in the Access Unit.

The 802.5 standard describes special connectors, called "dual-purpose connectors," that can mate a cable with a chassis. such as the wiring hub, or can mate two cables together to extend them.

The central cable hub concept is also used in systems such as AT&T's StarLAN and Standard Microsystems' ARCnet. Unfortunately, the IBM Access Units have no visible indication of network operation like these systems do. For instance, Proteon's ProNET-10's hub has lights that indicate a good electrical connection, while the hub for AT&T's StarLAN and Standard Microsystems' ARCnet have lights that indicate network operation. Though primitive. these indicators are nonetheless useful for troubleshooting network cable and connection problems.

Because the Token-Ring's electrical ring topology requires every workstation to actively repeat signals, the failure of one station halts network traffic. Under some ing. You can purchase the hardware either

conditions, network interface cards will self-test and disconnect themselves from the ring if they're malfunctioning. But in other circumstances, if the particular failure of an interface card causes it to stay silently in the ring or to generate improper packets, the network will not function. In these situations, you must physically disconnect the faulty station's cable from the IBM hub to restore operation.

And since many companies store the wiring hub in a closet some distance from the nearest network workstation, network troubleshooting becomes a two-person operation. One crouches in a dark wiring closet disconnecting one cable at a time, while the other watches a workstation screen, waiting for network activity to resume. When the network comes back to life, the watcher tells the wire puller which cable caused the outage. This routine happens so often that people who maintain IBM networks bitterly joke that their most important troubleshooting tool is a pair of walkie-talkies; one for the person in the wiring closet, and another one for the workstation watcher.

These products from Proteon and Racore are a response to both the successes and flaws of the IBM system. In the reviews that follow, you can see for yourself which is the most attractive system for your application.

PROTEON INC.

ProNET-4

Proteon is a serious player in the high-end local area network business. ProNET-4. which we review here, is Proteon's IEEE 802.5 standard alternative to IBM's Token-Ring Network. In addition, the company offers a proprietary token-passing system, ProNET-10, reviewed in "Making Connections: LANs Under NetWare. PC Magazine, December 9, 1986, as well as an ultrareliable fiber-optic system, ProNET-10 p320x, reviewed in "Making Connections: The Who, Why, and How of Fiber-ontic LANs," PC Magazine, January 12, 1988.

The ProNET-4 system consists of two kinds of hardware: network interface cards and wiring hubs. It also comes with software that helps with network troubleshoot-



ProNET-4 Proteon Inc Two Technology Dr.

Westborough, MA 01581-5008 (617) 898-2800 List Price: p1340 PC interface card, \$695:

p1344 AT interface card, \$695; p2710 Intelligent Wire Center, \$995; p2700 Multistation Wire Center, 5895; p6000 ProNET-4 Network Management Kit, including one Intelligent Wire Center, three p1340 PC interface cards, one p1344 AT interface card, Token-VIEW-4 software, and serial-bus interface,

In Short: This alternative to IBM's Token Ring Network hardware provides excellent features to help you manage a network. The cards are not directly interchangeable with IBM's interface cards, but they can operate on the same network with other IEEE 802.5 hardware if the appropriate software drivers CRICIL 668 ON READER SERVING CARD

separately or packaged in various kits. It is in these hubs that Proteon adds value to the standard IBM-type system.

In addition to marketing the ProNET-4 interface cards for IBM PC- and AT-type computers, Proteon also makes the cards for systems using the Multibus, VMEbus, UniBus, and O-Bus. The Model p1340 card uses 8-bit I/O for the PC-bus systems. The 8-bit card allows a maximum throughput of 2 megabits per second between the ring and the PC's memory. The Proteon Model p1344 interface system for the 16bit AT bus has full on-board DMA (direct memory access) for efficient data transfer. This card is normally used in servers in which heavier data transfer loads require the card's maximum 3.5-Mbps ring-tomemory transfer rate. These network interface cards are well designed and can take advantage of the higher-numbered DMA channels in PC AT systems.

You can use these cards on a network with IBM's Token-Ring hardware, but they are not plug-compatible replacements for IBM's cards. Instead, you must install customized drivers for the networking software or use the card manufacturer's NETBIOS. Drivers for ProNET-4's cards are provided with Novell's Advanced If you're looking for powerful software to solve your network problems...



.you should

You could invest thousands of dollars in network hardware. Or hundreds of thousands. Yet to fully realize your network's potential, you need the right software.

That's why you should be seeing Novell for total network software solutions. As a networking leader, Novell has

pioneered the tremendous rise in PCbased networks. Today, Novell's vision of networking starts at the desktop and expands outward toward the goal of total computer connectivity.

That vision begins with NetWare," the recognized standard for local area network operating systems. With an installed base of over a million workstations, NetWare puts power in the hands of network users at all levels: from ELS NetWare, for entrylevel solutions, to SFT"NetWare, providing high-performance system fault tolerant networking.

Beyond NetWare, Novell offers PCOX™ software for linking PCs and LANs with mainframes and minicomputers. And bridging software to connect separate LANs.



be seeing red.

Novell also provides programming tools like MHS, and Btrieve* and XQL* file management software. Plus extensive support for independent developers of network applications.

With all these software products and more, Novell gives greater flexibility and reliability to your network. And pushes the total networking spectrum closer to seamless connectivity.

End your search for powerful network software. See your Authorized Novell Gold Reseller, or call 1-800-LANKIND. For more information, call from your modem 1-800-444-4472 (300-1200 baud, 8 bit, no parity, 1 stop bit) and enter the access code NVSOF6.



For network solutions, you should be seeing red.

Proteon's ProNET-4 system consists of the wire center (the Intelligent Wire Center is shown here), the Proteon p1344 network interface card, TokenVIEW-4 software, and a serial bus interface for the controlling PC. We tested the system running under Novell's Advanced NetWare, Like IBM's Token-Ring Network, Proteon's ProNET-4 system uses a physical star topology, but electrically. the stations on the network are connected in a ring.



NetWare and Banyan's VINES networking software. To install Proteon's network interface cards on either of these operating systems, you simply make a selection on the installation menu. Proteon also supplies software meeting the Department of Defense's Transmission Control Protocol/Internet Protocol (TCP/IP) standards for use in networks of computers with different operating systems.

WIRE CENTER Proteon adds value to its Token-Ring system with its ProNET-4 wire center and unique TokenVIEW-4 software. Together, the processor in the wire center and software running in a PC make network troubleshooting an easy job requiring only one person.

Externally, the ProNET-4 p2700 Multistation Wire Center is nearly identical to the IBM wire center, fitting into the same



The Connectivity **Decision Guide**

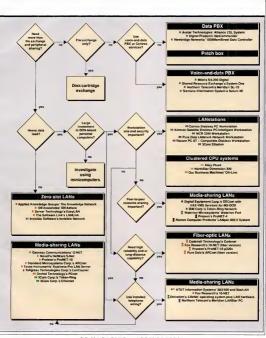
This chart is designed to help you select from among the many informa and resource-sharing alternatives. As you can see on the chart, if all you really need to do is exchange files or share pri then you should consider devices such as PBXs and patch boxes. If your organizaion has not already invested heavily in PCs or DOS programs, then a minicon puter might meet your needs more ecoically. But if you want many users to share data files simultaneously under DOS, a LAN may be the best alternative Once you've decided on a LAN, the need for station-to-station resource sharing and other factors will influence your network

purchasing decision. Because manufacturers include many ent features in their networks, so products will not fit neatly into one decision box in this guide. You'll also find that the lack of diffe LANs is becoming as large a problem in the LAN industry as the lack of standards was 2 years ago. But overlapping feature and technical similarity between networks are good news for potential buyers. They will let you concentrate on more-tradi factors such as dealer support and price tead of on more-technical coneiderations

Reviews originally appeared in PC Magazine:

- cember 9, 1996 December 23, 1966 nry 13, 1967
- ary 27, 1967 my 10, 1987
- ruary 24, 1987 h 31, 1987 April 14, 1987
- NY 26, 1987 ne 9. 1987 23, 1987
- luly 1987 st 1987 per 29, 1987
- er 27, 1987 ry 12, 198 ry 26, 198
 - April 26, 1988

Black marker indicates current issue



Benchmark Tests: ProNET-4 and LANpac 802.5 System

he results for the two Token-Ring alterna-The results for the two tives were understandably similar. However, the 16-bit-wide interface of the ProNET-4 p1344 interface card used in the AT server improved performance under heavy load conditions (in this case, more than four workstations). Racore's LANpac and Proteon's ProNET-4 systems were faster than the Banyan and 3Com systems manily because they were tested running under Novell's Advanced NetWare operating system, which handles data more efficiently than the software used in these other systems.

The PC Labs LAN benchmark tests are written in C and a independent of commercial software. We ran the lests on a test-bed of six 8-MHz IBM PC ATa. For our test-bed to better simulate the conditions on a medium-size network of 20 or more workstations, we designed these loading tests so that a single station represents five to tan times the load

ing records) on a network.

By themselves, the elapsed times reported in these tests are not meaningful. They are valuable only when used to compare the performances of two or more systems running under near-identical conditions. Accordingly, we include the lests run on our Editor's Choice configuration of a 3Com 3Server3, 3 + Share software, and EtherLink interface cards to provide a point of comparison. We also show re-sults from a network of Novell's Advanced NetWare 286, EtherLink cards, and an IBM PC AT as the server. Ad-EtherCrist cards, and an BMH PC AI as the server AG-venced MeMber a our Estarts Chacles for networking poli-men, and our tested configuration as a typical one. We also include the results of Barryants system, which includes Bur-yans DTS Deals for Barryant system, which includes Bur-yans DTS Deals for Barryant systems. Benyanis Interface cards, and VMES melanting potheres: Bomyanis LAN system has emerged as one of the top three players in the LAN mantaplace.

The Network Speed Under Load and the Hard Diek coess Load benchmark tests measure the time needle perform a standardized task on the network. While the ual work loads used for these two tests (described be low) are different, we used the same procedures for both. To obtain the elipsed times shown here, we ran a bench-mark program performing a sequential oreste, a sequential read, a sequential write, a random read, and a random write of a large file. The record sizes used in these activities.

systematically rotate between 16K, 4K, and 512 bytes. The systematically rotate between 16K, 4K, and 52 bytes. The currations allowin in the three-dimensional chart are the stotal time reconsary for all of these operations. We rain the lead time reconsary for all of these operations. We rain the lead time to be supported to the control of the control of times. We then reduced the number of survisitations one all time to show the affect of loading on the network This Metwork Speed Under Loading and the product on the retwork interface (cards, media, and so forth) while placing a minimal load of minimal cold by the wing such some production of the control of the place of places of the control of

changing the data each time. For systems with disk cach-ing, the load on the hard disk is even smaller, since caches

systems bycomity partition a disk wints but do not require a provised disk rade.

The provised disk rade of the provised disk rade disk and disk caching system. To do this, each station rade of the rade of the provised rade of the ra secondarying accesses of a footh in the deat see of the accesses perform the same operation but also lock the data record and update its contents. The remaining accesses update the indice file and a data record. The indice accesses update and the DOS 3.1 RLOCK statement prevents struktureous indice the updates.

Network Speed Under Load Performance Times

(Times given in seconds)			Zere	One	Two	Thres	Foor	Five	Six	
Server	Interface cord	Software	stations		stations	stations				
Benyan DTS DeskTop Server	Meridian LANStar PC	VINES	687	762	935	1,085	1,238	1,463	1.718	ī
3Com 3Server3	EtherLink	3+Share	306	432	529	651	761	868	1,122	1
8-MHz IBM PC AT	LANpac 802 5	Advanced NetWare 286	409	425	435	470	523	573	612	3
8-MHz IBM PC AT	ProNET-4 p1340 PC and p1344 AT	Advanced NetWare/286	411	422	439	455	485	510	545	_
8-MHz IBM PC AT	EtherLink	Advanced NetWare/286	264	280	301	310	322	345	349	_

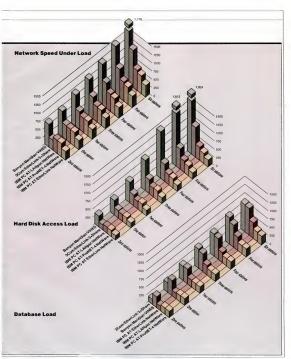
Hard Disk Access Load

Performance Times

(Times given in seconds)			Zere	One	Two	Three	Feor	Five	Ste
Server	teterface cord	Software	stations	statica	stations	stations	stations	stations	stations
Benyan DTS DeskTop Server	Meridian LANStar PC	VINES	332	431	614	907	1,414	1,812	1,924
3Com 3Server3	EtherLink	3+Share	155	227	330	419	522	620	902
8-MHz IBM PC AT	LANpac 802.5	Advanced NetWare/285	191	204	230	262	305	349	402
8-MHz IBM PC AT	ProNET-4 pt340 PC and pt344 AT	Advanced NetWare/286	192	208	260	278	280	288	311
8-MHz IBM PC AT	EtherLink	Advanced HefWare 286	138	150	162	174	182	187	210

Database Load

(Times given in seconds)		Zers	Oas	Two	Thres	Four	Five	Sis	
Server	laterface cord	Software	stations	station	stations	stations		stations	stations
3Com 3Server3	EtherLink	3+Share	155	298	425	585	669	799	824
Benyan DTS DeskTop Server	Meridian LANStar PC	VINES	332	468	446	533	630	667	806
8-MHz IBM PC AT	EtherLink	Advanced NetWare/286	136	169	212	280	305	405,	472
8-MHz IBM PC AT	LANpac 802.5	Advanced HefWare/286	191	199	206	211	223	252	289
S-MHz IRM PC AT	ProNET_4 o1240 PC and o1244 AT	Advanced MatMare 286	192	207	207	212	221	248	260



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and all journals

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statements are arways current

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ices full audit trails zero balance accounts can be suppressed in reports

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any customer invoices

fully paid invoice may be purged or retained automatically updates inventory and ledger accounts, and project records

user can define aging periods

reports produced on screen or printer including mailing labels, aged summary, aged detail and receivables journal

automatically displays customer names and numbers on screen when

required for program input

prints computerized invoices or supports manual invoicing

■ prints computerized customer statements with remittance stubs

ACCOUNTS PAYABLE uses open invoice method to keep track of full or partial payments against

any supplier invoice fully paid invoices may be purged or retained automatically updates inventory records, project records and ledger

user can define aging periods produces immediate vendor reports on screen or printer including

mailing labels, aged summary and details, and payables journal

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racks and using the same cable connectors.

Several small external differences, however, provide a clue to the intelligence of the Proteon device. The Proteon wire center has a switch and a light under each connector. The light indicates that the station attached to that connector is active. The switch electrically disconnects the cable from the hub, so you don't have to physically unplug it.

STATION MASTERS. Each Protoco wire center also he light labeled proure and "hattery," Obviously, the hurseure and "hattery," Obviously, the hursequies AC power and has an internal toquies AC power and has an internal toquies AC power and has an internal toquies AC power proposed to the protoco hadtery backup. The relays in the Protoco hadtery has to the right possions automatically
when the power comes on, climinating the
need to use and frome importantly to find
the small alignment tood used by IBM. The
battery hackup powers the unit through 4
hours of operation. While you don't need
an alignment tool, you do need to supply

power to the Proteon wire hub. But since wiring closets have power available by definition, we think Proteon's design solution is a good one.

Proteon's second version of this hub, the p2710 Intelligent Wire Center, contains a microprocessor and a special communications link. This microprocessor links to any PC via the PC's Rs-222 Serial port. Proteon software running on the PC works with the Intelligent Wire Center to monitor signal quality, to respond to network events such as wire faults, and to

compile a database on network operation.
You need only one of these Intelligent
Wire Centers in the network, and it will interact with any other Proteon Multistation

Wire Center to control the network. Frankly, only a masochistic LAN manager would stick with the IBM wire center after seeing the Proteon system in operation, particularly for systems with multiple wire centers and many nodes. SOFTWARE: Proteon's TolezwiFely destroyer offen a serie of screens that give the network administrator a great deal of capability and information. Each screen contains a main network event log that keep the manager up to date on ring errors ing the ring. You can use it to select a complete log of network events and lists of wire centers and nodes. The list of nodes shows stations according to both the serial numbers of their network adapters and the cache addition can'd. ATT') you assign to each addition can'd.

The network event log clearly shows which station's adapter cards are creating token errors. You can also use the Token-VIEW-4 software to disconnect a station from the ring if Proteon wire centers are located throughout the ring. In effect, this means a network manager can trouble-shoot a problem and restore network operation in seconds without entering a wire



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closet or touching a single cable.

Another feature of the TokenVIEWA Software is that by using certain options, you can specify that only registered adapter cards are allowed on the ring. The soft-ware will automatically remove any unautorized station entering the ring. If you have valuable information traveling over access to every foot of cable, this security feature is valuable.

IN USE We assembled a Proteon ProbleT-4 network with one p2710 lines and seven network nodes running under Novel1's Advanced NetWare. The sever contained a Proteon interface card designed for the 16-bit bus. Proteon selfs an OEM version of Novel1's Advanced NetWare with its cards presented in Network of Novel 1's Advanced NetWare with its cards presented in Network of Novel 1's Network of Novel 1's Network of Novel 1's Network of Novel 1's Network of Network

We used standard IBM cable to connect the cards to the wire center. We also in-

stalled two IBM Token-Ring cards running under NetWare on two other network nodes and connected them to the Proteon wire center. We ran the TokenVLEW-4 software from a separate IBM PC AT (al-

though it can run on a network node). The IBM and Proteon products played together without a hitch. It was interesting to watch the Token/VIEW-4 displays show the ring break and reform as stations entered and left. We had no madfunctions to troubles-hoot, but it was easy to use Token-VIEW-4 to delete nodes from the network. PUEW-4 to delete nodes from the network and the town of the tow

BOTTOM LINE Proteon's ProNET-4 network interface cards are quality products in what looks like an opening commodity market. Our experience has shown that they will operate in a network that also has stations running on IBM's Token-Ring



LANpac 802.5 System Racore Computer Products Inc 170 Knowles Dr. Los Gatos, CA 95030

(408) 374-8290 List Price: LANpac 802.5 interface card, \$495; LANpac 802.5 Multiple Access Unit, \$395, LANpac 802.5 cables (with connections): 25 ft., \$36:50 ft., \$57: 100 ft., \$100; 250 ft., \$250.

In Short: An alternative to IBM's Token-Ring Network hardware, featuring a low price and a wire center half the size of the hubfrom Proteon and IBM. The cards are not directly interchangeable with IBM's cards, but they can operate on the same network if the appropriate drivers are used. GREG. 1877-081/REDISTRIVE CARD.

cards and that they have an excellent interface with Novell's Advanced NetWare.

UNABLE LAN.

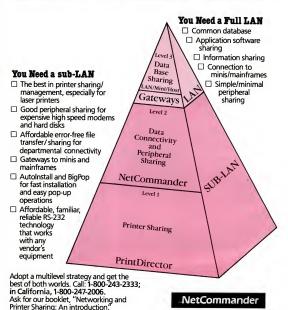
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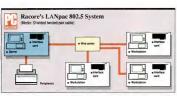


LAN or sub-LAN?



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Racore Computer Product: LNPput 802 5 System consists of a small wire center equipped with 9pin connectors and the LNPput 802.5 network interface card, which interfaces with the 8-bit has of a PC, XT, or AT. We tested the system using on AT as a server, running under Novell's Advanced NeWare. Like the Proteon and IBM systems, the Racore system uses a physical star topology but connects the network stations in an electrical rise.



We think every LAN manager should consider the Proteon Multistation Wire Center and Intelligent Wire Center instead of the IBM wire center. These units offer significant features (though at higher prices) that will be especially valuable to anyone with a large Token-Ring network.

RACORE COMPUTER PRODUCTS INC.

LANpac 802.5 System

Racore Computer Products' approach to the Token-Ring market combines compatibility with small size and low price. The product itself is an IEEE-802.5-compatible network interface card and wire center. The cards sell for \$495. The Racore Multiple Access Unit isn't much to look at, but it also isn't difficult to install or expensive to buy. Priced at \$395, the unit, which is about half the size of competing hubs, fits easily under a desk, behind a

cabinet, or anywhere power is available.

The Racore LANpac 802.5 System network interface card is based on the Texas
Instruments TMS330 chip set. The company markets only an interface card with
an 8-bit data bus and doesn't provide a card
secifically designed for server use. The

Racore card uses the same 9-pin miniature connector used by IBM. We used the Racore cards on both the IBM and Proteon wire centers with no difficulty.

Because Racore's card is not one of the standard selections on Novell's Advanced NetWare operating system or shell generation menus, Racore provides files for you to use to generate versions of NetWare with the appropriate drivers. Adding the necessary Racore drivers to the Novell GINSH (generate shell) and GENOS (generate operating system) floppy disks: a case, Nowever. You simply copy some files into a subdirectory on the appropriate case, Novel disks. Bell Mis FC Local Area Novel disks. Bill Mis FC Local Area Novel Novel Misses and Section 1997 of the Novel Parama or Tomas Standards.

work Program or Toms's Tapestry.
The Racore SOL: 5 Multiple to Above
The Racore SOL: 5 Multiple to Above
switches, but the relays in the unit align
switches, but the relays in the unit align
tool when power comes on. You do, however, need to place the Racore MAU near
wall socket, and a small wall-plug traumat backup pottery. Logically, if you man
backup pottery. Logically, if you man
backup newer for the server and otheretroverk nodes. Because of the MAU's
and the server and other
retroverk nodes. Because of the MAU's
node and share the backup nover source.

The selling points of the Racore MAU are its size and price, both of which result from Racore's use of 9-pin subminiature connectors instead of the larger and more-expensive 802.5 dual-purpose connectors.

The Racore Model 8306 Multiple Access Unit is 4½ pit inches wide, 9½ inches long, and 1½ inches high, one about half the size of competing units. Ten 9-pin connections of the pin connection of the p

There are pros and cons to using 9-pin connectors on the MAU. On the one hand, they are small, inexpensive, and available, unlike the multipurpose connectors used

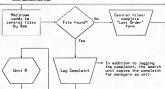
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■ PRONET-4 AND LANPAC



· ProNET-4

Proteon's ProNET-4 Intelligent Wire Center is the one every manageer of a Token-Ring LAN will want to have. Proteon did an excellent job of providing important and useful features that improve the maintainability and reliability of a Token-Ring system. Token-Ring interface cards. however, are becoming commodity products. Save a few dollars-buy the Racore interface cards for workstations and invest in the Proteon wiring hub

by IBM and Proteon. On the other hand. you can attach and disconnect IRM and Proteon's multipurpose connectors in just a few seconds, white you must screw and unscrew Racore's 9-pin connectors, a process that requires a small screwdriver and some dexterity and takes about a minute. This can be frustrating when you're troubleshooting a LAN by disconnecting each station from the MAU. But if you never experience a malfunctioning interface card, the smaller and cheaper Racore connectors are a benefit.

MIX AND MATCH. When we used the Racore MAU with interface cards from IBM, Proteon, and Racore, all worked together well. We connected the Racore MAU to the Proteon MAU and attached stations to both hubs, and they all communicated with the same server. The Proteon Intelligent Wire Center reported when stations entered the ring through the Racore MAU, but it couldn't control the access of individual stations on the Racore MALL

If you want to expand an existing system or start a new one at a reasonable price and with little hassle over special connectors, the Racore LANpac Token-Ring system is an alternative you should definitely consider.

Frank J. Derfler, Jr., is a contributing editor of PC Magazine.



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The Performance

The Ethernet Benchmark test report shows a significant higher I/O throughput for the D-Link Ethernet card DE-001 than its major counter-parts.

The Compatibility

The D-Link Ethernet DE-001 is one-hundredper-cent hardware compatible with Novell NE-1000 Ethernet card. This lets you directly plug your D-Link Ethernet card in a Novell Ethernet network.

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on AT (28th, CPU speed 10M

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PRODUCTIVITY

■ PC LAB NOTES: OS/2 INSTALLATION ■ CHARLES PETZOLD

CLEANING UP AFTER IBM, PART 2

IBM's OS/2 installation program is handy but lacks finesse when it comes to organizing files. Here are some alterations you can make to increase your hard disk's breathing room.

In the previous Lab Notes column, I reviewed the Blo MOS2 installation process and the file structure it leaves on your hard disk. We began to bether organize your hard disk to accommodate OS2, by moving files and creating subdirectories. In this installment, I'll show you how to make ure the cleamp is complete. As a bomas, I'll discuss the OS2 files that you can remove from your hard disk and never know they're missing.

User-installable device drivers are files with an .SYS extension that you can install by using DEVICE statements in the CON-FIG.SYS file. After installing OS/2, all user-installable device driver files are located in the \OS2 subdirectory. Let's move them to a directory named

MD \OS2\SYS COPY \OS2*.SYS \OS2\SYS DEL \OS2*.SYS

\OS2\SYS, instead.

When you executed that DEL command, were you expecting to get another error message telling you that the .SYS files reason you din't get it is that OS/2 loads .SYS files into memory at boot-up. Code segments in .SYS files cannot be discarded from memory, so OS/2 has no reason to prevent the files from being deleted.

User-installable device drivers are usually "dual-mode" drivers. That is, they apply to both OS/2 Mode and DOS Compatibility Mode. For this reason, they are loaded into the lower 640K of memory.

To reflect the new directory in which the .SYS files are stored, you'll have to change all of the statements in CON-FIG.SYS that read DEVICE = C:\OS2\driver.SYS

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to instead be in the form of DEVICE = C:\OS2\SYS\driver.SYS

where driver is the name of one of the SYS files. These driver files are documented in IBM's OS/2 User's Reference, so I'll discuss them only briefly here.

The ANSL SYS driver has been with us since DOS 2.0. This is one of two OS/2 device drivers that work in DOS Mode only. (ANSI screen and keyboard control is built sinc OS/2 Mode and handled by the ANSI-CALL DLL dynamic link library.) The other device driver that affects only DOS Mode is EGA. SYS. If you have as EGA. SYS Should always be installed.

All other device drivers are used by both OS/2 Mode and DOS Compatibility Mode. They have the same file format as dynamic link libraries.

The EXTDSKDD.SYS driver replaces the DOS 3.3 DRIVER.SYS and allows you to access an external diskette drive using two different drive letters. The COM01.SYS and COM02.SYS device drivers allow you to use the serial ports in OS/2 Mode. COM01.SYS is for the AT; COM02.SYS is for the YS.

POINTID SYS is a "pointer device driver" that supports a pointing device such as a moses. If you have a moses, you need a DEVICE statement for POINTID SYS and a second DEVICE statement referencing one of the nine mose device drivers included in OS2. (IBM's installation program copies all nine mouse drives to your hard disk, just in case you happen to have nine mice in-stalled on your machine.)

■ PC LAB NOTES

Finally, there's VDISK.SYS, a familiar sight since DOS 2.1. I always like to have a small RAMdisk around as a "scratch pad" area for creating temporary files. You can create a small 64K RAMdisk by adding the line

DEVICE = C:\os2\sys\vDISK.sys

to the CONFIG.SYS file. You can create a larger RAMdisk by adding a parameter that indicates the size in kilobytes. Under OS'2, the RAMdisk is always installed in extended memory. If you have one hard disk and no external diskette drives, the RAMdisk will be installed as drive D.:

A warning: After you install a RAMdisk, you might be tempted to specify that OS/2 use the RAMdisk for swapping by changing the SWAPPATH statement in CONFIG.SYS like this:

SWAPPATH = D:\

But that makes no sense at all! If you have a RAMdisk large enough to store the swap file, then OSZ would not need to do swapping at all if the RAMdisk were not installed. (Think about it.) However, you can speed up printing just a little if you specify that SPOOL. EXE use the RAMdisk for storing its temporary files.

SYSTEM DEVICE DRIVERS In addition to the .SYS files now in the \OS2 \SYS subdirectory, there are some .SYS files in the root directory. OS/2 loads these

■ The install program copies files for both the AT and the PS/2 to your root directory.

device drivers automatically while booting, and they must be in the root directory of the boot disk. However, you have more .SYS files than you need. The IBM installation program copies files for both the AT and the PS/2 to your root directory regardless of which machine you have.

The COUNTRY.SYS file is used for both the AT and the PS/2. It contains coun-

try-dependent information. These .SYS files are used only by the AT:

CLOCKØ1.SYS DISKØ1.SYS KBDØ1.SYS

PRINTØ1.SYS SCREENØ1.SYS

The following .SYS files are used only by the PS/2:

ABIOS.SYS CLOCK#2.SYS

DISK02.SYS KBD02.SYS PRINT02.SYS SCREEN02.SYS

Under DOS, device drivers for the clock, disk drives, etc., were part of IBMBIO-COM, a file that grew larger with each successive DOS version. The OS/2 version of IBMBIO.COM is only 4K long.

The ABIOS.SYS driver used in the PS/2 takes advantage of the PS/2 "Advanced BIOS" routines that run in protected mode. But take a look at the contents of ABIOS.SYS by entering

TYPE ABIOS.SYS

You'll find that it's not really a .SYS file at all but a simple ASCII file containing a list of four other files:

F80000.BIO F80100.BIO FC0400.BIO FC0500.BIO

These files are also in your root directory. If you have a PS/2, the .SYS files with a O1 in the name are not needed in the root directory. If you have an AT, the .SYS files with a O2 in the name and the four BIO files are not needed in the root directory.

Let's move the unneeded files to the \OS2\SYS directory just to get them out of the way. For example, if you have a PS/2, you'll execute commands like

COPY CLOCK#1.SYS \OS2\SYS DEL CLOCK#1.SYS and so forth.

THE CODE PAGE FILES OS/2 includes four "code page" files with the extension .DCP. The installation program

copies these files to the root directory. The .DCP files are referenced by DEVINFO statements in the CONFIG.SYS file.

A "code page" is the same thing most of us call a character set. These files allow the use of foreign language keyboards and international character sets on the EGA, VGA, IBM 4201 Proprinter, and IBM 5202 Quietwriter printer. So, let's move these. DCP files to a directory named VOS2UCP:

MD \OS2\DCP COPY *.DCP \OS2\DCP DEL *.DCP

Now change all references to these .DCP files in CONFIG.SYS to indicate the new directory. For example, you would change the command

DEVINFO = SCR, VGA, C:\VIOTBL.DCP to instead say

DEVINFO = SCR, VOA, C:\OS2\DCP\VIOTBL.DCP

If you're using a U.S. keyboard, you don't need any DEVINFO files at all in CONFIG.SYS. The OS/2 installation always adds the DEVINFO line shown above, but you can delete it from the CON-

FIG.SYS file if you want.

DOSCALIS IMPORT LIBRARY THE OVERS addirectory contains a fit amend DOSCALIS-LIB. This is an "import, in-tury." If you write programs for GS/2, you'll run the GS/2 LINK program to create an EXE fit of your program. When you run LINK, you specify DOSCALIS-LIB as a library for LINK to use LIDS-CALIS-LIB contains information that all the control of the LINK programs from the LINK fit of the LINK programs from the LINK programs from the LINK fit of the LINK programs from the LINK pr

Let's move this file to a directory called

\OS2\LIB thus

CALLS.LIB file.

HD \OS2\LIB COPY \OS2\DOSCALLS.LIB \OS2\LIB DEL \OS2\DOSCALLS.LIB

If you later write OS/2 programs under OS/2, you'll add a statement like this to the OS2INIT.CMD file:

SET LIB = C:\OS2\LIB
This allows LINK.EXE to find the DOS-

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■ PC LAB NOTES

LIBRARY MADNESS The word "library" and the extension. LIB are used for several different types of files in DOS and OS/2. This naming convention obviously creates some confusion—let's try to sort them out.

DOS programmers are familiar with "object code libraries," which have the extension LIB. These files often contain code for frequently used subroutines of when a program is being linked, code from the library files is brought into the EXE file. Object code libraries are usually supplied with compilers, no object code libraries are usually supplied with compilers, no object code libraries are included with OSV.

The DOSCALLS.LIB "import library" I just discussed is structured very much like an object code library, and it is also used by LINK. However, instead of containing code, the import library contains information necessary for LINK to construct an LESE files on the program can call routines located in any dynamic link libraries.

The word "library" is also used when speaking about "dynamic link libraries." These files have the extension .DLL and contain functions that an OS/2 program can call when it is running. (More details about dynamic link libraries can be found in my Environments column in PC Magazine, October 27, 1987.)

You'll also find three other OSZ files that have a L. IB extension's SHELL-IIF-ILB in the root directory, INTRO LIB in the VOSZANTRO directory, and INSTABLUB in the VOSZANTRO directory. These files contain templates for the various screens and windows displayed in the Program Selector, the "Introduction to OSZ" program, and the installation to oSZ" program, and the insta

THE EXECUTABLE PROGRAMS At this point, the VOS2 directory contains all the external commands with .COM or .EXE extensions, and the files HELP BAT, HELP.CMD, and MORTGAGE .BAS. (Would an IBM operating system be complete without MORTGAGE

You may have heard that OS/2 does not support .COM files, only .EXE files. So Further, you should add to your AU-

BAS2

why does OS/2 include a bunch of .COM files that run in OS/2 Mode? Well, despite the .COM extension, these are really .EME files. But some existing DOS proposed to the common control of common control c

Let's move these programs into a subdirectory named \OS2\PRG, like this:

MD \OS2\PRG COPY \OS2*.* \OS2\PRG

Virtually all of these files are sufficiently documented in the OSZ User's Reference, and many of them are familiar external commands, so I wort discuss them here. However, notice that the IBM manual only documents the HEP command and not the HEP, MSG, EXE program. HEP, is catually a batch file: the HEP, CMD batch file: runs in OSC 200 Mode and the HEP, BY, MSG Them in DOSC Computibility. HEP, and the Teams in DOSC Computing the HEP, MSG, EXE to display help information.

HELPMSG.EXE accesses an ASCII file named OSO001H.MSG for this help information. This file is stored in the root directory, but you can move it to \OS2 \PRG thus:

COPY \OSO#61H.MSG \OS2\PRG
After moving all the external commads into the \OS2\PRG subdirectory,
you should change the PATH and DPATH
statements in OSZINIT.CMD, which is
the OS/2 Mode "natio exce" file. OSZINT.CMD is stored in the root directory.
Change the PATH and DPATH statements
in OSZINIT.CMD to these:

PATH C:\OS2\PRG DPATH C:\OS2\PRG

The DPATH statement specifies a data file search path, and it is needed only so that HELPMSG.EXE can find OSO001H MSG.

.MSG.
The reference to \OS2 in the PATH
statement in your AUTOEXEC.BAT file
should also be changed to \OS2\PRG.

TOEXEC.BAT file an APPEND statement (which is the DOS Compatibility Mode equivalent of DPATH):

APPEND C:\OS2\PRG

This allows HELPMSG.EXE to find OSO001H.MSG when you run HELP or HELPMSG under DOS Compatibility Mode

You'll also have to change the directory for SPOOL.EXE in the CONFIG.SYS file:

RUN = C:\Os2\PRG\SPOOL.EXE [etc]
Now, after you reboot, you can delete ev-

Now, after you reboot, you can delete everything in the \OS2 directory and also the OS0001H.MSG file in the root directory, thus:

DEL \OS2*.* DEL \OSO881H.MSG

THE COMMAND PROCESSORS The not directory contains two command processors that display the command limport and execute internal commands. COMMAND, COM is familiar from DOS and is the command processor that truss in the DOS Compatibility Mode. CMD, EXE is the OS/2 command processor. Both these files can be moved to the \text{\colorate} VOSZ-\text{\colorate} PRG subdirectors.

COPY \COMMAND.COM \OS2\PRG COPY \CMD.EXE \OS2\PRG

In CONFIG.SYS, change the PROT-SHELL ("protected-mode shell") statement to this:

PROTSHELL = DMPC.EXE SHELL11F.CNF SHELL11F.EXE C:\OS2\PRG\CMD.EXE /C OS2INIT.CHD

[The above must be typed as a single line.—Ed.] Similarly, change the SHELL statement to this:

SHELL = C:\OS2\PRG\COMMAND.COM C:\OS2\PRG /P /E:1824

[The above must also be typed as a single line.—Ed.] After you reboot you can delete the two command processors from the root directory:

DEL \COMMAND.COM DEL \CMD.EXE

When OS/2 boots up, it normally leaves you in the Program Selector. If you would rather be left at an OS/2 command

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■ PC LAB NOTES

line, you can create a file named START-UP.CMD in the root directory. This file can contain commands that must be run only once when you boot up (such as copying some files to a RAMdisk), followed by the line

OSZINIT.CHD

OS2INIT.CMD is also executed when you start a new OS/2 session from the Program Selector.

FILES IN THE ROOT DIRECTORY By this time, your root directory should be looking a little less crowded. You can get rid of two additional files in the root directory like this:

DEL \INSTALL.LOG DEL \SYSBAS.EXE

These files are merely by-products of the installation process.

The root directory contains the two hidden files IBMBIO.COM and IBMDOS .COM, but you won't see these with a DIR command. These files must remain where they are. The root directory also has all the .SYS files for the clock, disk, keyboard, etc., and (if you have a PS/2) the .BIO files. These files must remain in the root.

You have four ASCII files that are used for starting the system and executing commands in OS2 Mode and DOS Compatibility Mode sessions: CONFIG.SYS, STARTUP.CMD, OS2INIT.CMD, and AUTOEXEC.BAT. All of these except

OS2INIT.CMD must remain in the root directory. OS2INIT.CMD does not have to be in the root directory, nor does it have to be named OS2INIT. If you want to change the name or location of this file, you just have to specify it in the PROT-SHELL statement of your CONFIG.SYS

The Program Selector comprises six files in the root directory, as shown in the accompanying table: "Program Selector Files." You can move SHELLI IF EXE and SHELLI IF Files in the root directory.

Besides SHELLIIF-EXE, you also have three other LXE flies in the root directory: HARDERR.EXE, EXE flies the record directory that DEFR.EXE, and DMPC.EXE. The first two must be in the root directory because they are loaded when OSZ boots. HARDERR.EXE handles pop-up screens for "abort, fail" errors and SWAPPER.EXE handles swapping. DMPC.EXE is more problematic. It does not have to be in the root directory, but if it is moved out, the most directory, but if it is moved out, the most of the problematic is does not have to be in the root directory. but if it is moved out, the most be changed as well as health files in the INTRO and INSTALL directories. Leave it in the root directory.

You'll also find three files that are named with the .MSG (message) extension: OSO001.MSG, ISPD, MSG, and ISPM.MSG. Most text that is displayed by internal and external OS/2 commands is in OS/00/1.MSG. The message text is separated into a different file to allow easy conversion of the programs to foreign language markets. These files must be in the root directory.

CHANGING FORMATS.TBL Finally, the root directory contains an ASCII file named FORMATS.TBL. You can display the contents of this file by using the TYPE command

When you format a diskerte with the S option under DOS, FORMAT copies IBMBIO.COM, IBMDOS.COM, and COMMAND.COM to the target disk. However, under OS/2, more files are needed to create a bootable disk. FORMATS.TBL contains a list of these files. FORMATS.TBL contains a list of these files. FORMATS.TBL must be in the root directory for FORMAT to access.

If you've been following the steps in this article, however, some of the files list-ed in FORMATS.TBL have been moved to other directories. Thus, if you want to create bootable diskettes, you must edit this file and change the affected lines. For example, the .DLL files are now in VOS2 VDLL. So, any line in FORMATS.TBL such as

filename.DLL should be changed to

C:\OS2\DLL\filename.DLL

After you change FORMATS.TBL, try formatting a diskette with the /S parameter to see if you changed all of these filenames correctly. FORMAT will report which files it could not find.

WHAT YOU CAN DELETE Although BY OSC 218ks up 3 megabytes of hard disk space, you can reclaim some of that space, you can reclaim some of that space has desired to the space of the space o

IBM's OS/2 comes with a program called "Introduction to OS/2." By all means, check it out. If you're still awake when the program ends, you can type

Program Selector Files SHELLIFE.NE Program Selector program. SHELLIFE.NB Templates for screen and windows. SHELLIFE.NB Application profile file. SHELLIFE.NB Configuration file. SHELLIFE.NB Contains file of programs that can be run from the Program Selection. SHELLIFE.NB Contains information needed for running the programs filesten in SEGLIFE.NI Selection.

DEL \OS2\INTRO

You can then also remove it from the Program Selector.

IBM's OS/2 manual is very vague on the files in the VOSZUNSTALL directory. I suspect that IBM will make information available to other software manufacturers so they can use this installation program for installing their own applications. Thus, you should probably leave the directory on your hard disk.

If you won't be programming for OS/2, you can delete the DOS/CALS.LIB fills from \OS2\LIB and remove the directory. You can also delete LINK.EXE in the MOS2\RPG directory. If you won't be moving out of the U.S. or won't need to install a foreign language keyboard, you can delete the .DCP files in the \OS2\DCP directory.

Now think about this for a momen: The OS2 installation program copies both the AT and PS/2 system-installable device drivers (such as CLOCKOL SYS and CLOCKOL SYS and CLOCKOL SYS and CLOCKOL SYS to your hand disk. Why is this? Well, you may need to formut a bootable OS2 diskette for a system other han your own. For example, if you have an AT, you may need to formut a bootable diskette for a PS/2. That diskette will require CLOCKOLSYS even if your AT does not.

However, if you want to format a diskette for another system, you must have an external 1.44MB 3½-inch diskette drive on your AT or a 1.2MB 5½-inch diskette drive on your PS/2. As far as we know, these external diskette drives do not yet even exist!

So, if you have an AT and you do not need to format an OS2 boot diskette for a PS22 (or vice versa), you can delete all the SYS files in \OS2SYS that do not apply to your system. If you have a PS2, you can delete all SYS files with a 01 in the name. If you have an AT, you can delete all SYS files with a 02 in the name and the four. BIO files.

BECOMING FRIENDS WITH OS/2 The unfamiliar is always a little scary. I remember that in 1983 many people were leery of DOS 2.0 because of all the new commands in that operating system. Now-

adays, fear of DOS 2.0 seems silly.
Similarly, all the unfamiliar files in

OS/2 make the operating system seem quite complex on first encounter. But after sorting these files into manageable groups

Charles Petro
PC Magazine.

(each with its own subdirectory), it begins to look a little more coherent.

Charles Petzold is a contributing editor of



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SPLITTING UP THE KEYBOARD COMBOS



Only basketball players can hit Shift-F6 on the new IBM keyboards, and the handicapped have always deserved a way to separate keystroke combinations. STAYDOWN is the answer.

Dobody at IBM can type. That seems a fair inference, at least, from the company's history of changing keyboard layouts every couple of years. Not content with in infamous kirls and because his content with the infamous kirls and key and XT, the Pc AT, shifted the Excussion of the infamous kirls and kirls and XT, the Pc AT, shifted the Excussion and the infamous kirls and the infamous kirls and the infamous kirls and the infamous kirls and the produced its 101-key "Enhanced" keyboard, which, among other hings, reductates all the function keys we'd spent thousands of hours training our fingers to find without thinking.

Maybe our muscle memories for the old function-key arrangement will pass away, but so too will the convenience of entering key combinations like Ctrl-F8 and Alt-F1 with one hand. Best-selling word processors, spreadsheets, databases, and utilities of every ilk popularized and perfected the use of the 40 function-key combinations. They polished their user interface to make every feature of an application available through single keystroke combinations that never required the right hand to move from home position. But not with IBM's "Enhanced." model-of-the-future keyboard. It's as if a company that can't sell its own software wants to make everyone else's software equally unsuccessful,

There's nothing software can do to reloboard trickery can make the situation slightly more livable. STAYDOWN, the keyboard utility introduced here, turns awkward keystroke combinations into keystroke sequences. It temporarily locks down (ignores the break code of) any CAI, or Shift key that is pressed until it receives the break code from a second key. Thus, the Alt-S combination becomes Alt followed by S, and SideKick can be popped up by pressing and releasing Ctrl, then touching Alt.

STAYDOWN works in the background and has no effect on normal keyboard operation. It offers you the option of breaking a double-keystroke combination into its component parts, but it does not require you to do so. And it's perfectly compatible with all members of the IBM family, including he IOI-key keyboard with its dual Ctrl and Alt keys and its 83- and 84-key progenitors.

STÂYDOWN will also provide welcome relief for handicapped members of the user community who are physically limited to pressing a single key at a time. Try printing a WordPerfect document by simultaneously pressing the Left Shift and F7 keys with a mouthstick and you'll understand why these men and women repre-

 STAYDOWN turns awkward keystroke

combinations into keystroke sequences.

Thus, Alt-S becomes Alt followed by S.

sent some of the most dedicated and persistent users in the industry.

As usual, the easiest way to obtain STAYDOWN. COM is to download it from the PC Magazine Interactive Reader Service, as described in the sidebar "STAYDOWN by Modem." The source code, STAYDOWN.ASM, and STAY-DOWN.BAS, which you can use to create STAYDOWN.COM, are listed here and are also available on the PC-IRS.

USING STAYDOWN STAYDOWN is a short memory-resident utility that includes the capabilities of temporarily disabling itself on command and even of completely removing itself from memory. The command syntax is

STAYDOWN [/D] [/U]

The optional /D parameter allows you to suspend operation of a copy already in memory, and /U uninstalls the utility altogether. Once disabled, STAYDOWN can be reactivated by being run again without any command line switches, just as if it

were being loaded for the first time. You lock the Crit, Alt, Left Shift, or Right Shift key down temporarily simply by pressing and releasing it. (I'll refer to these four hereafter as "shift" keys, using the lowercase "s" of distinguish the term from the name given the Left Shift and Right Shift keys on the keyboard.) The Right Shift keys on the keyboard. The strike will be affected as if the shift keywere still being held down. When the second key is released, the temporary shift state induced by STAYDOWN will be re-

moved automatically and your keyboard will act as it normally does. If you have SideKick loaded and ready for action, pop it up by pressing and releasing the CrIt key, then pressing Alt. Or enter WordPerfect's Screen menu by pressing the Ctrl key followed by F3.

lowed by F3.

You can cancel STAYDOWN's induced shift state by pressing and releasing the same key again. If you press Ctrl, for instance, then realize you meant to press Alt instead, Just tap Ctrl once again to tog-gle it off. Then you can start from scratch to enter the Alt combination you had originally intended.

You can still enter key combinations by pressing the designated keys simultaneously, even if STAYDOWN is loaded and active. When STAYDOWN senses that a shift key is pressed in conjunction with another key in the conventional manner, it doesn't lock the shift key; rather, it allows the BIOS to process each make and break so that normal keyboard activity is untinidered.

Note, however, that triple combinations like Ctrl-Alt-Del can't be executed a stroke at a time. Since the Ctrl state would be toggled off after Alt is released but be-

 You can still enter key combinations by pressing the designated keys simultaneously, even if STAYDOWN is loaded and active.

fore Del is pressed, STAYDOWN is suitable only for combinations of two keys.

While STAYDOWN is compatible with most major application programs, you'll undoubtedly find a few that won't

let it work. This is true of any terminateand-stay-resident program. Even those applications that are incompatible, however, should return control of the keyboard to

STAYDOWN when they terminate. When run initially, STAYDOWN will display its version number and a copyright notice. Reinvoke it with a /D parameter, and you'll receive the reply "STAY-DOWN: Disabled." Type STAYDOWN once more at the command line and it will answer "STAYDOWN: Activated " If you attempt to uninstall it with the /U parameter and another TSR has grabbed the same interrupt vector STAYDOWN borrowed, it will ignore the request and inform you, "Cannot Uninstall." If this happens, the only way (short of rebooting) to remove it from memory is with the aid of a commercial TSR manager, or with something along the lines of the IN-STALL/REMOVE utilities that appeared in PC Magazine ("Popping Out Your Popuns," PC Lab Notes, August 1987).

If STAYDOWN ever responds to your

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deinstallation command with "Uninstall Error," you would probably be wee to own phings up andher quickly, then reboot warp things up andher quickly, then reboot cases that after successfully unbooking; it self from one of the keyboard interrups and thereby effectively disabling itself. STAYDOWN's internal request to deallocate its program memory block has been denied by DOS. Since there's no good reason for DOS to turn the request down, it's best to assume that well-laid plans have gene away and your data is a trisk. And, of ull refusel to you'd from the control of th

An important note concerning deinstallations: loading a TSR on top of it will often not prevent STAYDOWN from politely removing itself from memory. The resulting hole in memory, while not of catastrophic nature, will never be put to efficient use by DOS's limited memory management kernel. It's sound practice to

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never uninstall a TSR that wasn't the last

THE ENHANCED KEYBOARD A short refresher on the BIOS keyboard interface, its handling of the family of shift keys, and the problems presented by the

■ The BIOS tracks the Ctrl, Alt, and Shift states in real time by assigning each a bit in low memory.

new look of the 101-key keyboard will make understanding the internals of STAYDOWN easier. The special keys Ctrl, Alt, and Shift are normally treated differently from the rest in that the BIOS tracks their respective states in real time by assigning each a bit in low memory. The lower 4 bits of the byte at 0040:0017h are dynamically updated to represent the up/down status of the Right Shift, Left Shift, Ctrl, and Alt keys (bit 0 to bit 3, respective).

tively). The BIOS forces the corresponding bit high when a key is pressed and clears is when a break code (the key's 7-bit scan code with the eighth bit of the byte set to 1) from the keyboard controller signals that the key has been released. A running application program can determine whence of the control program can determine whence of the control program can determine whence of the control program can determine whence and the control program can be controlled to the control program of the contro

Until the 101-key keyboard was introduced, a single byte in the BIOS Data Area was assigned to record shift key status.



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The addition of duplicate Ctrl and Alt keys required that at least two more bits be dedicated to the shift keys. IBM designated four. Realizing that a press of either or both Ctrl keys should constitute an active Ctrl state, the designers assigned a new bit to each Ctrl and Alt key. The original Ctrl and Alt indicators at offset 17h were now derived by logically ORing the left Ctrl and Alt bits with the right. In this way, not only was compatibility with existing software maintained, but programs written specifically for the new keyboard could determine the state of duplicate keys individually. The diagram "The BIOS Key-board Status Bytes" illustrates the mapping of the bytes in the BIOS Data Area whose bits reflect shift-key positions.

But there is far more new to the IO1-key keyboard than the added keys and re-

■ The Enhanced keyboard offers a choice of three scan code sets. The BIOS was updated to include support for about 45 new key combinations.

shaped numeric keypad. While each key on IBM keyboards has historically been assigned a unique scan code, new keys that duplicate existing ones (including Ctrl and

Alt) are identified by a sequence of two or more scan codes sent from the keyboard controller. Furthermore, the keyboard controller, Furthermore, the keyboard the controller hardware is empossible for the controller hardware is empossible for the controller hardware is empossible for the tended of the controller hardware in controller day values recognized by the BIOS, much as the original AT keyboard controller day when it converted 84-key keyboard scan codes to their \$5-key counterparts. And the BIOS itself was updated to include support for about 45 new lay combinations not recognized by earlier combinations not recognized by earlier

These changes have had a dramatic impact on the way programs are written. Code that needs to detect the new key combinations supported by the BIOS must use a new set of interrupt 16h functions. Func-

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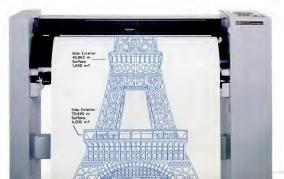
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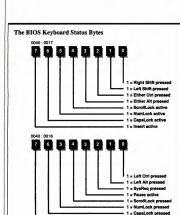


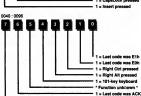
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A great deal of information on the status of the keyboard is maintained by the BIOS. Each bit acts like a flag, indicating whether a specified condition is met. tion 0, for example, doesn't report a press of Ctrl-Up Arrow or Ctrl-Down Arrow, while function 10h does. And utilities that monitor incoming scan codes must be alert for the scan code E0h, the first byte of a two-byte sequence that signals the make or break of the enhanced keyboard's new keys.

keys.

The Left Ctrl key, for example, generates the make code 1Dh; Right Ctrl generates E0th, then 1Dh. This distinction allows the BIOS to determine which key was pressed and toggle the appropriate shift state bit. Likewise, the Left Ctrl break value is 9Dh (1Dh + 80th), while a break of Right Ctrl is signified by E0h followed immediately by 90th.

One unexpected change to the keyboard interface comes from fair left field and is nothing less than maddening: the 2byte make or break code of 13 of the 101 keys is accompanied by an additional two (and sometimes four) sean codes if selected shift keys are simultaneously depressed or if NumLock is on. Pressing the dedicated gray PgUp key, for example, normally produces the machines does

EØ 49 (make) EØ C9 (break)

Pressing the same key with Left Shift held down results in

EØ AA EØ 49 (make) EØ C9 EØ 2A (break)

Holding down Right Shift instead produces

EØ B6 EØ 49 (make) EØ C9 EØ 36 (break)

and pressing and releasing PgUp with both Shift keys depressed sends the convoluted sequences

EØ AA EØ B6 EØ 49 (make) EØ C9 EØ 36 EØ 2A (break)

Not by coincidence, the extra scan codes AA/2A and B6/36 correspond to the Left Shift and Right Shift keys, respectively. But the single scan codes that follow the press or release of the Shift keys themselves are external to the sequences above.

This practice departs from IBM's longstanding tradition of leaving make/break codes independent of shift states. As you can see from the listings above, certain

1 = ID sequence in progress

ceps transmit different (used lengthier) sea obes sequences if either Shift key is donotes sequences if either Shift key is doressed or NumLock is activated. Further heir high bits set, but come as part of the belye make code of the PgUlp key itself. The significance of this is that, until now, ou could always differentiate between nake and break codes simply by testing bit or the procedent. It is clearly becoming to the procedent in the companion of the public processing and the processing and the processing and the new section of the companion of the public processing and the public size of the public processing and the public processing and the public processing and the public processing and the public public public public processing and the public processing and the public p

KEYBOARD MONITORS TSR pop-up publishes customarily reverse interruge 40 to honitor the keyboard for the press of their lockey, linearupe 9 is generated by the keyoard controller on all models of the PC owned or released. This practice has always violated BMS a policy of recomlending that programmers deal with the hardware exclusively through the Book bardware cuckinestey through the Book but the BIOS, as programmers are all painfully aware, is worefully inadequies.

More recent BIOS versions, however, including those installed in most ATs, some XTS, and all PS/2 machines) allowy programs to monitor scan codes through service 4th of interrupt 15h. The current unterrupt 9 handler reads a scan code with an IN from the keyboard data port and then, with the scan code in AL, examine or even alter a transfer and a scan code in AL, examine or even alter scan codes, therefore, need only tap into interrupt 15h with AH set to 4th. Any the scan codes, therefore, need only tap into interrupt 15h.

It is important to understand the ground rules for using this facility. A program interrupt ISh handler must first check to be sure that AH is equal to 48h on receipt and, pass it on to the BIOS handler if it's not. Control is passed back to the BIOS from function 47h with the simple execution of a RET 2 instruction. Using RET 2 (to exceed a far return and diseard 2 bytes from

ctack) is necessary because upon return COS takes action based upon the valbe carry flag. An IRET, you'll rereforms a far jump and places the word on the stack in the microprocessor's flags register, preserving the state of the flags through the interrupt han-

dling process but preventing the handler

from returning values in the flags.
If the carry flag is set on return from a
program's interrupt 15h code, the BIGS
processes the sear code as usual. A resident utility can alter the sean code by readwith its com scan code. It follows, then,
that AL must normally be preserved if we
don't wish to affect keyboard opens
don't wish to affect keyboard opens
from the BIGS can be told to ignore the sean
code altogether under the assumption that
the interventing handler dath the processing
corry flag clear.

carry Hag clear.

STAYDOWN uses this new feature on systems that support it and falls back on interrupt 9 for those that don't. The way to determine whether or not the support is there is to call interrupt 15h with AH set to COh. If the carry Hap is clear on return (a

■ It is becoming more desirable than ever to leave keyboard processing strictly to the BIOS if compatibility with future hardware is to be ensured.

condition we can test with JNC or JC), function 4Ph is supported; if the carry flag is set, support is lacking.

For keys that return multiple scan codes, the BIOS calls interrupt 15h for each one so that the data stream can be monitored completely. When STAY-DOWN wants a system that is equipped to service function 4Fh to ignore the release of a shift key, it clears the carry flag and exits. If a break code is to be ignored by a system in which interrupt 9 has been intercepted instead, STAYDOWN must manually reset the keyboard and signal the interrupt controller that processing is complete, enabling other system interrupts of equal and lower priorities. The ten lines of code following the label RESET_KEY-BOARD in the source listing illustrate ex-

actly how this is accomplished.

actly now microsaccomparative services and support according an apparature civiths. RET nather than with an IRET, you must define the body of the roatine as a FAR procedure. Near returns reset the IP register only, leaving CS unalient, which are returns cross segment boundaries by replacing both CS and IP with values pushed onto the stack. Whether a procedure is defined as FAR or NEAR is irrectly filed in IRET is used, since returns from interrupts are far by definition.

The procedures INT9H and INT15H, built to service interrupts 9 and 15h, respectively, are both defined with the assembler directive PROC FAR. If you've wondered why programmers have to bother with NEAR and FAR keywords in procedure declarations, look no further: it's to let the assembler know whether to code a RET mnemonic as a near or far return. Although Microsoft's Macro Assembler has traditionally offered only one RET (a generic one whose type is determined by declaration), the 8088 hardware offers two. Among the many improvements in MASM 5.0 is the option of extending RET to RETN or RETE, for RETurn Near or RETurn Far.

A LOOK INSIDE Once STAYDOWN has latched onto one of the keyboard interrupts to monitor scan codes, it invokes the procedum AMIN to process them. MAIN simply passes make codes through, storing their value for comparison with the next break code to determine whether the key was code to determine whether the key was code to the total code to the state of the code of the state of the code of the state of the key was one of the shift keys, the break is intercepted by STAYDOWN and a flag is set indicating that a false shift state is proceeded to the shift key active of the next break by zeroing the bit or bits that correspond to the shift key active or bits that correspond to the shift key active.

valed.

STAYDOWN ORs each make code with the byte EO.E-IA.G (which contains 0 if the last scan code was not EDh, or 80h if it was) before storing it away. A press and elease of the Right Crt or Alk tey is made distinct from the press or release of Left Crt or Alk, since a make from the right-hand side of the keyboard will have its high bit set after STAYDOWN ORs it with

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Jeff Prosise Purpose:

1988 No. 8 (Utilities)
Permits entering two-key Ctrl-, Alt-, and Shift-key combina-

Format: Remarks:

tions as separate keystrokes. STAYDOWN [/D] [/U]

The relocation of the function leys on IBM's "Enhanced" 101-ley keybrace makes it impossible to hold down a shifting key (Crt. Alt. Shift) and press a key simultaneously with one hand. Even with the 82-key (PC and XT) and 84-key (original AT) keyboards, many shifting key combinations have been an wekward for many users and sometimes impossible for the physically handicapped. STAYDOWN is an extrainate and safety-resident (TSb utility) that permiss the attention of the safety of the safety

The optional //D switch deactivates STAYDOWN until the command is entered again without the switch. The optional //J switch uninstalls the program and frees the memory it previously occupied. If another TSR program that uses the same interrupt vector has been loaded after STAYDOWN, a "Cannot Uninstall" message will be displayed. He message "Uninstall Error" appears, users should immediately save their work and reboot.

If a shifting key is mistakenly hit (and held down by STAYDOWN), just hit he key again to disengage it. With STAYDOWN loaded, users can choose to pop up the Sike/Kic utility either by hodling down the Ctrl key and presising/ releasing the Alt key or by pressing/releasing the Ctrl key followed by pressing/releasing the Ctrl key followed by pressing/releasing the Alt key. Note, however, followed by pressing/releasing the Ctrl key and pressing releasing the Alt key. Note, however, combinations such as Ctrl-All-Del must be entered conventionally.

STAYDOWN can be entered either at the DOS command line or, preferably, as a line in an AUTOEXEC.BAT file. It should be loaded before SideKick. While compatible with most applications, full compatibility with all applications cannot be guaranteed by any TSB program.

STAYDOWN BY MODEM

The programs published in PC Magazine new downloaded by modem from the PC Magazine Interactive Reader Service. Drete is no charge for this service, but users are cautioned that these provided in the property of the propert

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If you use the Xmodem protocol, you can download STAY-DOWN.COM directly, saving typing or downloading either the .BAS or the .ASM version. STAYDOWN.BAS, whether entered from the magazine at your keyboard or downloaded from PC-IRS, will automatically create STAYDOWN.COM when run once in BASIC. STAYDOWN .ASM, also listed both here and on PC-IRS, allows you to modify the program but requires you to use a macro assembler (IBM or Microsoft, Version 2 or later) and the following commands:

MASH STAYDOWN; LINK STAYDOWN:

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80h. STAYDOWN strips the high bit from | a break code and ORs it with EO_FLAG before comparing it with the last make code. This procedure ensures that a Left Ctrl make followed sequentially by a Right Ctrl break won't fool the program into locking the Ctrl state.

The interrupt 9 and 15h handling routines invoke MAIN identically, but procedure INT15H does a bit of preprocessing before calling MAIN. It intercepts E0h codes and processes them externally by setting a flag indicating the last code was of that value. It also hides the first 2 bytes

On keyboards with one Ctrl and Alt key, MAIN can toggle the Ctrl or Alt state off.

of a 4-byte make sequence and the last 2 of a 4-byte break (or the first and last 4 of a 12-byte make/break). This prevents special make codes greater than 80h from being interpreted by MAIN as breaks.

On keyboards that have only one Ctrl key and one Alt key, MAIN can toggle the Ctrl or Alt state off by zeroing bit 2 or 3 of the primary shift state byte at 0040:0017. But if there are two of each, the respective bit can only be reset if the bits representing both Left and Right Ctrl or Alt are also zero. When MAIN attempts to resolve an ignored break of Ctrl or Alt that is not preceded by the scan code E0h (this can come either from the Left Ctrl or Alt on an Enhanced keyboard or from the single Ctrl or Alt on an 83- or 84-key keyboard), MAIN must determine the type of keyboard before it can restore normal operation.

Making that determination is easy. Bit 4 of the third keyboard data byte at 0040:0096 is set to 1 by the PC's power-on routines if a 101-key keyboard is connected, or 0 if anythine else is attached. The machine code instruction

TEST ES: [SHIFT STATE 31,16H clears the microprocessor's zero flag if an Enhanced keyboard is detected.

UNINSTALLING STAYDOWN attempts to uninstall itself when run with the /U parameter. Deinstallation is a simple matter of restoring the sole interrupt vector STAYDOWN altered during its initializa-

tion, then deallocating the area of memory it occupies for use by other programs. The only hitch arises if another TSR has graphed the same interrupt STAYDOWN borrowed, thus making STAYDOWN an

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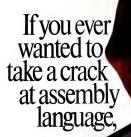
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nows the time.

You probably already know that assembly language subroutines are the smartest way to get the fastest programs.

But if the complexities of working in assembler made you think twice, here's some good news. We've made Microsoft* Macro Assembler Version 5.0 a lot easier to use.

We eased the learning process by giving you the best support around. We completely revised our documentation. The new Mixed Language Programming Guide gives you step by step instructions for linking your assembly code with Microsoft QuickBASIC, C, FORTRAN, Pascal and other languages. And you get a comprehensive reference manual with listings of the instruction set and examples of each instruction. We didn't stop there, though You also get an on-disk collection of templates and examples.

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see what it's like to break your personal speed limit.

intermediate link in the interrupt vector chain. In this event, removing STAY-DOWN would leave that vector pointing to unallocated space. The free memory is almost certain to be claimed and corrupted by another process or by DOS itself. And when the targeted interrupt is next general-diguaranteed to occur when you next strike a key, if not before), the system will come crashing down.

To prevent such a catastrophic occurrence, STAYDOWN verifies that the interrupt vector it replaced hasn't changed since installation by comparing the segment the vector currently addresses with

■ SideKick contains some now infamous code that periodically checks that another TSR hasn't stolen interrupt 9 away.

the segment in which the code was installed. If it has changed, a warning message is issued, and the removal process is aborted harmlessly before STAY-DOWN's memory space is deallocated.

There are even instances when STAY. DOWN can't remove itself even though it was the last TSR loaded. If you're using a PC that lacks the extended interrupt 15h facilities, for example, and you loaded Side-Kick before running STAYDOWN. STAYDOWN will report that it cannot be uninstalled. The reason is that SideKick contains some now infamous code that takes over interrupt 9 (the interrupt STAY-DOWN taps into if it can't use interrupt 15h). The SideKick code periodically checks (using the services of the timer interrupt) that another TSR hasn't stolen interrupt 9 away. SideKick does this to ensure that it has first crack at the keyboard interrupt. If STAYDOWN has revectored interrupt 9 to itself. SideKick jealously grabs it right back, STAYDOWN will still function properly since SideKick has at least the good grace to share the interrupt. but it won't attempt to uninstall itself when

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HOW MANY GLASSES OF WATER



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it senses that the vector has changed.

Since STAYDOWN discards the environment block it inherited from DOS before making itself resident, the only block left to free in the deinstallation process is to one given to its PSP and code aggment. Deallocation is accomplished with DOS service 49h. The function is invoked through interrupt 21h with the segment and does of the block to be freed in EX DOS should not deny the request unless its chain of memory control blocks has been cor-

 STAYDOWN shows one method a programmer might devise to alter

the keyboard's behavior.

rupted. If the system returns with the carry flag set, indicating the deallocation attempt failed, STAYDOWN responds by warning you of an "Uninstall Error."

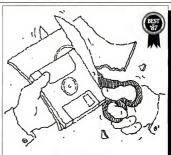
IN CLOSING STAYDOWN illustrates only one of many methods a programmer might devise to alter the behavior of the keyboard. For example, KBX.COM, the utility presented in PC Lab Notes, September 29, 1987, turned the NumLock and ScrollLock keys into auxiliary shift keys used to access upper-order ASCII characters. With the services of interrupt 15h available to let a utility monitor communications between the on-board keyboard controller and the system BIOS, redefining the entire keyboard layout would entail little more than pulling a new scan code value from a lookup table, then passing it to the BIOS in AL with the carry flag set.

The natural evolution of PC hardware and the problems associated with keeping software compatible with all generations pointedly illustrate why programs should delve no lower than the BIOS level (or preferably), the operating system level) when possible. The functions added to interrupt 15h (which originally served as the BIOS cassette port interface), help programmers write well-behaved code that should be directly portable to future systemics.

tems. The advent of OS/2—a real programmers' operating system—should spell the end of the days when utilities like STAYDOWN are forced to swipe internuts and other system facilities to gain ac-

cess to data streams they have every right to examine.

Jeff Prosise is a contributing editor of PC Magazine.



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A BUDGET OS/2 PROGRAMMING COURSE



Rather than requiring the \$3,000 OS/2 SDK, real programs can be written in protected mode by using the tools available in the IBM Standard Edition of OS/2.

In the last issue, I broke the good news that if you have IBM's OS/2 Standard Edition 1.0 and Microsoft's Macro Assembler 5.0, you have all the software you need to begin writing assembly language programs for OS/2. In this column, I'll make good on my promise to demonstrate exactly how this can be done.

Let's take a look at a sample program.

WAKEUP.ASM is the assembly language

ws version of a C program I described in an earlier Environments column (PC Maga-

To run WAKEUP.EXE, you enter the following command under OS/2:

DETACH WAKEUP hour:minute DETACH is an OS/2 internal command that runs the program that follows (in this case. WAKEUP) in the background.

When you enter the command line shown here, the OS/2 prompt returns but WAKE-UP will be running. You can load multiple copies of WAKEUP if you want.

WAKEUP resides quietly in the background until the time specified on the command line. WAKEUP then interrupts whatever you're doing and displays an urgent little message ("WAKE UP!" AKE UP! WAKE UP!"). The screen alternates

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		13. 18					

WAKEUP.ASM: The assembly language source code to create WAKEUP.EXE, a sample OS/2 program that interrupts you at a specified time with a flashing, beeping message. Note that this program requires Microsoft MASM 5.0.

ENVIRONMENTS

between white-on-red and red-on-white and WAKEUP beeps the PC's speaker in an annoying manner. Pressing any key allows you to return to your work.

(A warning: if you are absorbed in doing something on your PC when WAKE-UP sets off the alarm, it can give you a frightening jolt and destroy your concentration, to say nothing of possible damage to your heart.)

WAKEUP calls 12 OS/2 functions. All of these are listed at the top of the program in EXTRN statements. The function names have prefixes that indicate their general category ("Kbd" stands for keyboard and "Vio" stands for Video I/O). The DosGetDateTime and KbdCharln functions both use structures for passing information between OS/2 and the program. These structures are also defined near the top of the program. The OS/2 software development kits from IBM and Microsoft will probably supply "include" files to conveniently define these external functions and OS/2 structures so you don't have to.

CREATING WAKEUP.EXE To create WAKEUP.EXE from the WAKEUP .ASM file, you need Microsoft Macro Assembler 5.0, and the LINK.EXE program

 If you are absorbed in doing something on your PC when WAKEUP sets off the alarm, it can give

you a frightening jolt.

and DOSCALLS.LIB file included with IBM's OS/2 Standard Edition 1.0. You execute these two commands:

LINK WAKEUP, /ALIGN:16, , DOSCALLS ;

Since you have to run MASM.EXE in DOS Compatibility Mode, it's most con-

venient to run LINK.EXE in DOS Mode

The PATH string in your DOS Mode environment should be set up so that the directory containing the OS/2 version of LINK.EXE is listed before any directory that contains a DOS version of LINK EXE. Suppose, for example, that you keep MASM.EXE in a directory named MASM5. This directory probably also contains one of the many DOS versions of LINK.EXE. After installation of OS/2, the OS/2 version of LINK.EXE is stored in the \OS2 directory. In such a case, the PATH statement in your AUTOEXEC.BAT file should be arranged something like this:

PATH ... C:\082: ... C:\MASH5: ...

If you've moved LINK. EXE to a directory named \OS2\PRG (as I suggest in this issue's PC Lab Notes), then your PATH statement should look like this:

PATH ... C:\OS2\PRG: ... C:\MASH5; .

The LIB string in your DOS Mode environment should include the directory

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							(WAKEUP ASM continues)

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containing DOSCALLS.LIB. After you install OS/2, this is the \OS2 directory. So, your AUTOEXEC.BAT file contains a statement like

taining .LIB files, SET LIB = C:\OS2

Again, if you've moved DOSCALLS.LIB to my suggested \OS2\LIB directory, your AUTOEXEC.BAT file should contain a statement indicating that new directory:

If you don't have MASM 5.0, you can still create WAKEUP.EXE by typing the WAKEUP BAS listing shown into the OS/2 version of BASICA (which runs only under DOS Compatibility Mode, unfortunately) and running the program. Even if you don't have OS/2 vet, you can still create WAKEUP.EXE using your DOS vercion of DACICA WAVE

OS/2 utility program ready to use when you eventually install OS/2 on your system. That way, when someone pontifically observes, "OS/2 is worthless unless you

· Even if you don't have OS/2 yet, you can still create WAKEUP EXE using your DOS version

of BASICA.

have OS/2 programs," you can come back with, "But I already do have one," [We'll put the program on PC-IRS, as well.-Ed.1

HOW WAKEUP WORKS WAKEUP

into the number of minutes since midnight. The program then calls DosGetDateTime to get the current time, takes the difference between the two times, and converts the result to milliseconds. After pushing the number of milliseconds on the stack, WAKEUP then calls DosSleen. DosSleen suspends a program for the specified peri-

WAKEUP must sound the alarm when the DosSleep call returns control to it. The program's first move is to use VioPopUp to get control of the screen and keyboard. (This is the only way a detached program can write to the screen.) WAKEUP then uses VioWrtTTY to write the message, VioWrtNAttr to change the attribute (color) of the screen, and DosBeep to beep the speaker. During this flashing and beeping, WAKEUP checks if a key has been pressed by calling KbdCharIn. If so, the program calls VioEndPopUp to restore the screen that it interrupted. The program then terminates normally.

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gram would have to remain resident in memory and intercept interrupt 8, the hardware timer tick interrupt. At each timer tick, the program would decrement a counter until it reached zero. The code is not very complex, but nothing close to the simplicity of DosSleep.

nate and remove itself from memory. Under DOS, however, this would leave a small hole in memory if other RAM-resident programs had been loaded after WAKEUP

Under OS/2, by contrast, memory holes are inconsequential. Because proes, OS/2 can move program code and data segments around in memory to consolidate free memory space and eliminate the

DYNAMIC LINKING The mechanics of creating WAKEUP.EXE from WAKE-

After setting off the alarm, a well-done DOS version of WAKEUP would termilor tors rather than physical segment address-100 REH--BASIC PROGRAM TO CREATE MA 110 OPEN "MAKEUP.EXE" AS \$1 LEN + 1 120 PIELO \$1.1 AS AS 11, 106, 100, 106, 0, 106, 172, 154, 120 FERLO 41,1 AB AS
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WAKEUP.BAS: If you lack the knack to assemble, type in and execute this BASIC program that will automatically create the OS/2 demo program WAKEUP.EXE, which resides in the background until a specified time.

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gram. The only real oddity is that the DOSCALLS.LIB file must be specified as a LINK parameter.

DOSCALLS.LIB is an "import library" for OS/2 function calls. An import library is structured very much like the normal object code library programmers often use to store useful subroutines. When a program contains references to external functions. LINK searches the object code libraries for these functions and adds them to the .EXE file.

But an import library contains no code. Instead, the entries in the import library allow LINK to identify calls to OS/2 functions within a program and to construct tables in the .EXE file that reference these calls. OS/2 later uses these tables to link the function calls to the actual functions. This linking occurs when the program is run, which is why it's called "dynamic linking."

For example, WAKEUP ASM contains a far call to the VioSetCurPos function to set the cursor position. At the top of WAKEUP. ASM the function is defined as an external far function. The assembler penerates code for a far call to VioSetOur-Pos but leaves the address of the VioSet-CurPos function unresolved in the

 An import library is structured very much like the normal object code library programmers often use to store useful subroutines

WAKEUP.OBJ file.

When you run LINK to create the WAKEUP.EXE file, LINK searches DOSCALLS.LIB to find a reference to VioSetCurPos. The information in DOS-CALLS LIB indicates that this function is actually contained in the VIOCALLS dynamic link module. LINK adds this information to the WAKEUP.EXE file, but it still leaves the call to VioSetCurPos unre-



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solved. To WAKEUP, EXE, the VioSet-CurPos function is said to be "imported."

When you run WAKEUP.EXE under OS/2. OS/2 loads the program into memory and looks in the .EXE file to determine what imported functions it references. One

 The process of dynamic linking is generalized in OS/2 and allows the operating system to be easily expanded and enhanced.

of them is VioSetCurPos, which is located in the VIOCALLS dynamic link module. This is the file VIOCALLS.DLL, one of the many files that make up OS/2. The VioSetCurPos function is said to be "exported" from VIOCALLS

Because WAKEUP contains a call to VioSetCurPos, OS/2 allocates a block of memory for the VIOCALLS.DLL code segment that contains the VioSetCurPos function. The address of the function within VIOCALLS is then inserted into WAKEUP's call to the function. Thus, when WAKEUP is running and calls the VioSetCurPos function, control passes directly to the VIOCALLS module without any intermediary code.

This process of dynamic linking is generalized in OS/2 and allows the operating system to be easily expanded and enhanced. For example, the Presentation Manager component of OS/2 1.1 will be little more than a set of new dynamic link libraries

EXPLORING THE EXE FILE As you might expect, support of dynamic linking means that the format of OS/2 .EXE files must be somewhat more complex than that of DOS .EXE files. In my next column we'll explore OS/2 .EXE files by writing a simple OS/2 hex dump program and dumping the contents of .EXE and .DLL files

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THE POWER **PROGRAMMING** LIBRARY



Using the |ZI option to create your own Power Programming library of MASM procedures and subroutines; and some pressing questions answered.

The "Power Programming Library" table printed here lists the assembler code procedures and subroutines that have been published in the first ten Power Programming columns, 1If vou're missing any issues, the files can be downloaded by modem from the PC Magazine Interactive Reader Service.-Ed.1 If you haven't done so already, you should assemble all of the subroutines and place them in a library called PP.LIB. Figure 1 shows the commands needed and the library response. We'll be using these routines, and others yet to be published, extensively during the coming year. Use of the /ZI switch as shown in Fig-

ure 1, causes MASM to place certain debugging information into the object modules. This debugging information can be used by Microsoft's CodeView to display the source code associated with the machine code while you are debugging. Although it causes the final executable (.EXE) file for your program to be somewhat larger, use of the /ZI switch does not increase a program's runtime memory requirements-the debugging information sits at the very end of the .EXE file and is not loaded into memory by the normal MS-DOS program loader.

ERRATA In the program SHOWENV .ASM, which was published on page 352 of the January 12, 1988, issue, the closing single-quote marks (') somehow got dropped during the production process on the lines labeled msg1 and msg2 in segment DATA

The comments for the ITOA, ASM and

LTOA. ASM routines, published in the Power Programming column of February 29, 1988, stated that the buffers that will receive the converted ASCII string (pointed to by registers DS:SI) should be at least 6 and 11 bytes long, respectively. This is true enough for any radix of ten or greater. However, if you wish to use a lower radix with these conversion routines, you should provide appropriately longer buffers. For example, in the extreme case, where you are converting to ASCII strings with a radix of two, you should provide a 16-byte buffer for ITOA and a buffer of 32 bytes for LTOA.

In the January 26, 1988, issue there are three errors in the next-to-last paragraph of page 322 (the paragraph beginning, "Next, it determines. . . "). The two references to GETENV in this paragraph should have been to PUTENV, and the address SP: 002CH should have been PSP: 002CH (i.e., offset 002CH from the beginning of the program segment prefix).

POWER PROGRAMMING MAIL PC Magazine readers are a friendly and communicative bunch. Since this column started. I have been receiving three to five e-mail messages and letters a day with sug-

Power Programming Library

Name	Function	Issue
ARGC.ASM	Count command line arguments	Dec. 22, 1987
ARGV.ASM	Get address of command line argument	Dec. 22, 1987
GETENV.ASM	Get address of environment string	Jan. 12, 1988
PUTENV ASM	Add string to environment	Jan. 26, 1988
ATOLASM	Convert ASCII to 16-bit integer	Feb. 16, 1988
ATOL:ASM	Convert ASCII to 32-bit integer	Feb. 16, 1988
ITOA.ASM	Convert 16-bit integer to ASCII	Feb. 29, 1988
LTOA.ASM	Convert 32-bit integer to ASCII	Feb. 29, 1988
LCVT.ASM	Formatted-binary-to-ASCII conversion	Apr. 12, 1988
HTOL.ASM	Convert hex ASCII to 32-bit integer	Apr. 12, 1988

The general-purpose MASM subroutines and procedures that have been published in Power Programming columns, and where to find them

■ POWER PROGRAMMING

gestions, questions, and comments about the column and its programs. Here is a selection from among those of general interest, together with my answers. [As these letters were posted electronically, the correspondens' city and state of residence are not indicated.—Ed.]

B.TREESING

I am trying to learn C programming via the infanous bootstrap method; I am using Turbo C. My current problem has to do with creating B-reed/SAM files. I need help with the nitty-gritty code, not with abstract generallities. I want to create files that will provide random access to elements of data. I also need help with reading and writing into and out of these files. I have about a dozen books on C and data structures, none of which help.

Frank Beer

Management of B-tree indexed files is a complex subject. There are a number of able to do the job, such as Burieve, from Softcraft, and e-tree, from FairCom. Programmer's Connection, a well-respected mail-order distributor (tel.: (800) 336-1166), lists over 100 C utility and library packages in its catalog, many of which provide you with functions for indexed file

Of course, if you really want to write your own B-tree indexed file management routines, the necessary research into Btree techniques will be both interesting and educational. A good starting point is the enerable book Algorithms + Data Structures = Programs, by Niklaus Wirth, published by Peruice-Hall. You should be able to find it in any good technical or college bookstors.

The main question, which only you can decide, is whether you have time (and can afford) to retineent the wheel, or whether your time would be more efficiently spent if you buy someone else's library and concentrate your efforts on the design of your

```
good commercial library packages avail-

C-MASH /ZI ARGC; <Enter>
```

C-MASH /SI HTOL; <Enter>
C>LIB «Enter»

Microsoft (R) Library Manager version 3.88
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```
Library name: PP Cunter>
Library does not exist. Create? Y <Enter>
Operations: +ARGC & <Enter>
Operations: +ARGC & <Enter>
Operations: +OTERN & <Enter>
Operations: +OTERN & CENter>
Operations: +OTERN & CENter>
Operations: +ATGC & <Enter>
Operations: +ATGC & <Enter>
Operations: +ATGC & <Enter>
Operations: +TGC & <Enter
```

+HTOL <Enter>List file: <Enter>

c>

Operations:

Figure 1: Building the library PP.LIB. The IZI switch causes MASM to include debugging information for CodeView in the resulting object file.

WHICH C COMPILER?

I need to buy a C compiler, and my budget points me toward either Quick C or Turbo C. My impression is that Turbo C may be faster, more optimizing, and may offer more to the experienced user, while Quick C may offer more features for the beginner (like me), such as its on-line help and debugging environment. Any feelings on this? Should I shop only on price? Which compiler has better documentation?

Second, will my old Microsoft MASM, Version 1.25, work for the preliminaries, or should I file it with my old WordStar?

John Intorcio

The MASM question is easy to dispose ofupdate that rascal as soon as possible! The current versions of MASM are several times faster and more powerful than the version you are using, the documentation has improved immensely, and MASM 5.0 now comes with CodeView—Microsoft's nifty window-oriented mixed-language de-

bigger.
Which C compiler to get is a tougher call. I happen to like the Turbo C user interface a lot better than Quick C's: it's more visually attractive, the key assignments are more intuitive, the error window shows you more than one error a a time, and so forth. The only (minor) factor withing weights of the the continuity of the c

complete lack of mouse support.

So far as generating code goes, I have not been convinced that either compiler offers any great advantage over the other. Quick C's graphics library, debugger, and compatibility with Microsoft C 5.0 would probably carry the day here. Borland is promising a Turbo C debugger "real soon now," but since Borland's compiler technology is acquired rather than internally developed (Turbo C is actually a repackaging of Wizard C, for example, and Turbo Pascal appears to be derived directly from a European compiler called COM-PAS Pascal), it's hard to know whether it can deliver on this promise in a timely fashion. As for documentation, the Turbo C

manuals are comparatively weak, except for one very nice section designed for the Turbo Pascal programmer who is trying to learn C. The Turbo runtime library man-

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■ POWER PROGRAMMING

ual is poorly organized and doesn't come within light years of the Microsoft documentation. Microsoft has poured enormous effort into upgrading its documentation over several generations of their mainline Microsoft C compiler, and the Quick C manuals have really benefited from this effor.

WRITING TSRs

lim Ratti

The basic problem lies not in your code but in the fact that MS-DOS was designed to be a single-tasking, single-user operating system. The majority of the MS-DOS kernel is not "reentrant." That's to say, it cannot be called by an interrupt handler if it was adready executing at the time the interrupt occurred.

terrupt occurrea.
For example, imagine that an application has culted MS-DOS to perform a file
function, the file operation is no progress,
an interrupt occurs, and a program that is
noted by the interrupt aboc calls DOS on
the property of the progress of the property of
DOS's stacks and interrul variables yet
bashed, the context of the original file operation function call is lost, and a crash is
almost certain to follow.

There are a variety of ways to get around these reentrancy problems, most of which involve use of semidocumented or undocumented MS-DOS function calls and internal flags. Most or all of the necessary techniques have been presented in the body of the source code for the various "pop-up utilities" that have appeared in "PO Magazine" Productivity section over the last year. Programmer's Journal ran some nice articles on TSR programming in

1987, the ms.dos/secrets conference on BIX is a gold mine of TSR information, and the new MS-DOS Encyclopedia (Microsoft Press, 1987) contains a detailed chapter on writing TSRs, complete with a working example. Finally, you might find one or both of the following books to be helpful: Turbo C Memory Resident Utilities, Screen I/O, and Programming Techniques, by Al Stevens (MIS Press, Portland, Ore., 1987, ISBN 0-943518-35-0); Performance Programming Under MS-DOS, by Michael J. Young (Sybex Books, San Francisco, Calif., 1987, ISBN 0-89588-420-8). Both books contain extensive information on writing TSRs.

CORNUCOPIA OF QUERIES

Joel A. Charbonnet, Jr., submitted a lengthy list of worthy questions. I've arranged them and provided a reply to each individually, below.

- Q. To which audience is your column directed, a novice or an experienced C and assembler programmer?
 A. I guess I'm still working this out to some
- Programmers are drooling over the 80386, which has segments as large as 4 gigabytes, and six segment registers,

to boot.

extent, but my mental image of the typical Power Programming reader is either (1) a programmer with some Pascul or 16 Med Programmer with some Pascul or 16 Med programmer what wants to learn some thing about assembly language, or (3) on assembly language programmer who needs additional tools for his work and wants to pick up some information about higher-level, structured languages to specify and the programmer was sent C and MASM programming topics in parallel: the C programmer can use is is C experience as a stepping stone to understanding the MASM routines, the MASM programmer can do the same in the other direction, and the BASIC or Pascal programmer can pick his poison!

Q. In "Building on a Sound Structure" (Power Programming, December 8, 1987) you stated, "... the maximum amount of memory that it [a program] can address simultaneously is 256K." Is this because one has only four segment registers to use and each one can access only 64K?

and each one can access only 64K? A. That's right. Incidentally, this gives you some idea why programmers are drooling over the 80386, which has segments as large as 4 gigabytes, and six segment registers, to boot.

Q. In the same issue, you wrote, "A minimum of three segments must be declared in an .EXE program: a code segment, a data segment, and a stack segment." Does each one have to be a unique segment? If this is true, then a minimum of 192K is needed to run even the smallest of .EXE programs. Am I understanding this correctly?

A. Here we are getting into some confusion between the "logical," named segments as they exist in source code for a program, and the physical segments that exist at runtime. Each physical segment need not occupy 64K—It can be as small as 1 byte—Due to the saddressed independently by placing its base paragraph address in a segment register.

Q. What exactly do "Groups" do for us? What happens if you don't specify "DGROUP"? Are there any other special Group names?

A. The dictoration of a "Group" allows several different logical segments to be addressed from the same physical segments to be address. In other words, you can use different segment numes in order to force the lather to group certain code or data tothe lather to group certain code or data toments of your program, and then declare the segments as Groups so that the code or data in each can be accessed without the need to change the contents of a segment register. Of course, all the logical collable's segment on the linker will issue an

■ POWER PROGRAMMING

error message and your program will not execute properly.

DGROUP is a name used by the Microsoft compilers (and linker) to designate the segment that holds the "near data" (accessed through segment register DS) and the program's stack and local heap. If you are programming purely in MASM for MS-DOS, you can ignore it; however, if you wish to mix MASM and C routines. proper use of DGROUP is essential. DGROUP also has specific significance under OS/2 and Windows, where it receives special treatment from the system loader, which brings programs into memory for execution. I'll discuss this subject in more detail in future columns.

O. What do the "Combine Type" and "Class" names do for us? Can they be ignored?

A. The optional "Combine Type" in a segment declaration controls the way the linker lumps together segments with the same name that are found in different obiect modules. For example, logical segments with the same name and the "public" attribute are concatenated together in the same physical seement, while seements with the "common" attribute are overlapped so that they all have the same base address.

In addition to the control you can exert with segment names and the order of segment declaration, "Class" names allow another level of control over segment ordering by the linker. For example, once the linker has collected all logical segments with the same name together according to their combine type, it then arranges differently named segments with the same class name so that they are adjacent in memory. Chanter 5 of the MASM 5.0 Programmer's Guide contains a very nice discussion of segment naming, segment attributes, groups, and classes.

O. What is "ASSUME" used for?

A. The ASSUME directive notifies the assembler which segment registers you are using to address which named segments. This allows the assembler to generate segment overrides automatically when they are needed, and to warn you when you reference a label or variable that can't be reached with any of the current segment

register contents. Note that ASSUME does not generate any code! You have to load the segment register with the correct value with separate, explicit instruction statements, as, for example:

ax,_DATA mov mov ds, ax assume ds: DATA

Q. In "Parsing Routines in C and Assembler" (Power Programming, December 22, 1987), I believe there is a typo in the code on page 367. What appears as

mov ax,3888h

21h

arqv8: int should be

mov ah, 30h int 21h Is this correct?

A. My code is (in this case, at least) correct. The instruction the case of MS-DOS, Versions 1.x, where

mov ax, 3000h places 30h in AH and 00 in AL. This covers

 DGROUP has specific significance under OS/2 and Windows, where it receives special treatment from the system loader.

function 30h is not a defined function sup ported by the operating system. When MS-DOS 1.0 and 1.1 are called with an illegal function number, they simply return to the calling program with all registers unchanged. Initializing register AL to zero before making the function 30h call ensures that your program won't be misled under MS-DOS I.x by some spurious value that just happened to be in register AL prior to the call.

1988), you wrote "When one program (the parent) uses the MS-DOS EXEC function to launch another program (the child), it must provide, as one of the parameters, a pointer to an environment block." Does the parent just randomly choose a place for an environment block? A. The parent program can build a new environment block anywhere it wants and can pass the pointer to it, so long as the new environment is paragraph-aligned (i.e., its address is evenly divisible by 16). Most of the time, though, the parent simply passes a zero pointer for the environment, so that the child inherits a copy of the parent's environment.

O. Does the parent randomly put information into this environment block or is it

empty? A. If the parent program builds a new environment block to pass to the child program, it should take care that the new environment looks like the one that would be provided by COMMAND. COM if the child program was run directly by typing its name at the MS-DOS prompt. In most cases, if the parent wants to pass information through the environment, it should simply append this information to a copy of its own environment and pass a pointer to the modified copy. The parent should never pass an "empty" environment to a child, because this would make it impossible (or very difficult) for the child to load and execute a secondary copy of COM-MAND.COM (since it would be missing the PATH and COMSPEC environment variables).

O. Is the parent passing a pointer to a preexisting environment block? If so, why can't the child update it, since the child has a pointer to that environment block?

A. In every case, MS-DOS copies the block supplied by the parent, or the parent's own environment, to a newly allocated block of memory and supplies the child program with a pointer to the new block. Thus, the child program never has direct access to the parent's environment.

O. Who determines where to place the environment block for the child program? A. MS-DOS, in its infinite wisdom, decides where to place the environment for

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The compilers are presently available in two formats: Microport Unix 5.3 or MS-DOS as extended by the Phar Lap Tools, MicroWay will port them to other 80386 operating systems such as OS/2 as the need arises and as 80386 versions become available

The key to addressing more than 640 kbytes is the use of 32-bit integers to address arrays. NDP Fortran-386 generates 32-bit code which executes 3 to 8 times faster than the current generation of 16-bit compilers. There are three ements each of which contributes a factor of 2 to this speed increase: very efficient use of 80386 registers to store 32-bit entities, the use of inline 32-bit arithmetic instead of library cal and a doubling in the effective utilization of the system data bus.

An example of the benefit of excellent code is a 32-bit matrix multiply. In this benchmark an NDP Fortran-386 program is run against the sa program compiled with a 16-bit Fortran. Both programs were run on the same 80386 system. However, the 32-bit code ran 7.5 times fast than the 16-bit code, and 58.5 times faster than

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Phar Lap* created the first tools that make it possible to develop 80386 applications which run under MS-DOS yet take advantage of the full power of the 80386. These include an 80386 monitor/loader that runs the 80386 in protected linear address mode, an assembler, linker and debugger. These tools are required for the MS-DOS version of the MicroWay NDP Compilers. Phar Lap Tools

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the child program. (Almost always it's immediately before the child's program segment prefix, at the base of the memory block holding the program's code, data, and stack.)

O. Is the code for this environment passing and building in the parent process, the EXEC function, or MS-DOS?

A. The code for environment building and passing is in the EXEC function (interrupt 21h function 4Bh), which is logically a

 The parent simply passes a zero pointer for the environment, so that the child inherits a copy of the parent's environment.

part of the MS-DOS kernel. In some IBM versions of MS-DOS, however, the main part of the EXEC code is physically located (for inscrutable reasons) in the transient portion of COMMAND.COM, which complicates things immensely for people who are trying to write a replacement MS-DOS "shell" or command processor.

PC MAGAZINE'S IRS

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CIRCLE 113 ON READER SERVICE CARD

TAKE A PEN AND POINT TO ANY PART OF THIS 1' SQUARE.

OR MOVE YOUR HAND ALL OVER THIS PAGE.

Why are we asking you to go through this little exercise?

To show you a new PC input device called Felix. And to demonstrate how different it is from an ordinary mouse.

Because as you may have noticed, pushing a mouse around a big foam rubber pad isn't the most precise way to move a cursor on your screen.

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The same microprocessor also senses your hand speed. When you move slowly the sensitivity is adjusted to give you the highest level of precision. When you speed up, Felix snaps into a high-speed mode that lets you cover the entire screen instantly.

Even the size is more precise. Felix is only 6' square. Compare that to the space you need to leave clear for a mouse or digitizing pad. Felix is a lot more reliable, too life a sealed unit that's been tested.

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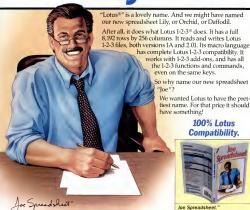
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CIRCLE 101 ON READER SERVICE CARD

SPREADSHEET CLINIC



Safeguarding macros from display and accidental deletion; canceling {onerror} statements; measuring print range width; showing the way back when you shell out to DOS.

CANCELING (ONERROR)

Canceling an {onerror} condition does not need to be as complex a procedure as that described by Anders Forssell in the September 29, 1987, Spreadsheet Clinic. Forssell described the method he uses to cancel an {onerror} statement when the error that is intended to be trapped does not occur. In such a case he routes the macro to a statement such as {onerror OK}. This statement cancels the previous (operror) statement and instructs 1-2-3 to route the macro to the cell named OK if an error occurs. OK contains a command that does not affect the execution of the macro. Next, he routes the macro to a statement that deliberately causes an error. This error trips the new {onerror} statement, which branches the macro to the innocuous command in OK and cancels error trapping.

There's a far simpler way. In your macro, just include an (onerror) statement that does not have any arguments. When 1-2-3 executes this command, it cancels any (onerror) condition that may be in force at the time and does not impose another.

Here's another little-known property of the {onerror} command: If an error trips an {onerror} command during the execution of a subroutine, I-2-3 forgets that it is in a subroutine. Thus, instead of returning to the main macro when it reaches the end of the subroutine, I-2-3 ends the execution of the macro.

Loren Krienke San Diego, California command, we'd like to point out a useful but seldom-used feature of the (noerror) command: its ability to record the error messages. If you include the name or address of a cell as the second argument of an (noerror) command, and an error trips that command, 1:2-3 will record the message that would have been displayed at the bottom of the screen in the cell specified by that argument.

For example, the statement {onerror RESUME_ERRMSG} commands 1-2-3 to record the message for the error that trips it in the cell named ERRMSG. If you trip that statement by typing the name of a file that doesn't exist after issuing the |File Retrieve command, 1-2-3 will enter the label "File does not exist" into ERRMSG.

1-2.3's ability to record these error messages makes it possible to create "conditional" (omeror) commands. The macros shown in Figure I demonstrates this technique. This macros is designed to print the range you specify. Two principal things could go wrong during the execution of this macro: the user could specify on invalid range, or three could be a ordered.

lem with the printer. The {onerror} routine in this macro catches both errors and reroutes the macro differently for each one.

The first statement in this macro commands 1-2-3 to route the execution of the macro to the cell named TEST in the event of an error and to record the message for that error in the cell named ERRMSG. The second statement issues the |Print Printer Range command and allows you to specify the range you want to print.

In most cases, 1-2-3 will continue by printing the range you specified, then end the macro. If an error occurs, however, 1-2-3 will enter the message for that error into the cell named ERRMSG and route the execution of the macro to the cell named TEST. If you specified an invalid range. FRRMSG will contain the label "Invalid cell or range address." In that case, the first (if) statement in TEST will be true and 1-2-3 will return to the beginning of the macro. If you specified a valid range but there was a problem with your printer, ERRMSG will contain the label "Printer error." In that case, the second (if) statement will be true, and 1-2-3 will tell you to

Mr. Krienke is correct on both counts.

Figure 1: You can create conditional error-trapping routines by recording the message for the error that tripped the lonerori command and comparing it with the message for the error that the second [JERMSOG =] line is a single line, not wo to ask shown.

■ SPREADSHEET CLINIC

check the printer and then press Enter. When you do so, 1-2-3 will route the macro back to the cell named PRINTIT (the third statement in the macro). The statement in that cell commands 1-2-3 to print the range you specified.

MEASURING A RANGE, REVISITED In the Spreadsheet Clinic of May 12. 1987, William J. Sheppard described a ruler he uses to measure the width of a spreadsheet range. His instructions call for the user to type the characters 1234567891 repeatedly, to create a ruler that is at least as

long as the range to be measured. I've found a way to avoid the tedium of typing all of these characters manually. First, set the width of the current column to whatever width (up to 240 characters) you want your ruler to be. Next, enter the label \1234567891 into that cell. Since this label begins with 1-2-3's repeating label prefix (the backslash), 1-2-3 will automatical-

ly display the repeating sequence 123456789 | 123456789 | . . .

all the way across the cell's width. The cell will contain only the ten characters 1234567891, however

Once you have entered this label, you should print it to a file. To do this, use the Print File command; specify the name of the file in which you want to print what is displayed in that cell; set the left margin to 0; specify a right margin greater than the width of the cell you are printing; choose the Unformatted option to suppress the spacing for top margins, bottom margins, headers, and footers; return to the main Print menu: and choose Go. Works will then print the ruler into a one-line text file, exactly as it appears in the cell.

Once you have saved the ruler in a PRN file, you can import it into any worksheet that contains a range you want to measure. Just insert a blank row above the range you want to measure, move the cell pointer to the cell of that row that is in the leftmost column of the range, issue the /File Import Text command, and choose the name of the file to which you printed the ruler. The ruler will then appear in the worksheet. You can then use the ruler to measure the width of the range.

Laura Klein Chicago, Illinois

\a /rncRANGE /rndRANGE /rncRANGE {?} {Goto} RANGE

(Let WIDTH. 8) {For COUNTER, 1, @COLS(RANGE), 1, MEASURE}

(Let WIDTH, WIDTH+@CELLPOINTER("width"))

{Goto}WIDTH~

{Right} COUNTER

MEASURE

Figure 2: This macro measures the width of a range.

The technique described by Ms. Klein works in any release of 1-2-3. In fact, it's the best we've seen for creating a ruler (or any long, repeating label) in 1-2-3, Re-

lease IA However, for users of 1-2-3, Release 2 and 2.01 (as well as all releases of Symphony), there's a still easier way to create a ruler. Instead of widening a cell and using the repeating label prefix, you can use 1-2-3's @REPEAT function. Specifically,

you'd use the function @REPEAT("123456789|".x)

where x is the number of times you want 1-2-3 to repeat the string. For example, you would use the function

GREPEAT("123456789|",24) to create a 240-character ruler. The string result of this function will overlap any blank cells to its right, so you can use it to

measure the width of any range.

Since this function is relatively simple, it's not difficult to enter it manually into any worksheet that contains a range you want to measure. If you wish, however, you can use the /File Xtract command to save it in a .WKI file, then use the /File Combine command to combine it into any worksheet that contains a range you want to measure. If you want to save the result of the function (the ruler) instead of the function itself, you should use the /Range Values command to replace the @REPEAT function with its result before you use the /File Xtract command.

Rather than use a ruler to measure the width of a range, however, we prefer to use the simple macro shown in Figure 2. The first statement in the macro lets you highlight the range you want to measure.

(You need to select only one cell in each column of the range.) The second statement moves the cell to the first column of that range. The third statement enters the value 0 into the cell named WIDTH. The fourth statement sets up a {for} loop that 1-2-3 executes as many times as there are columns in the range. During each pass through the loop, 1-2-3 adds the width of the current column to the value in WIDTH and moves the cell pointer to the next column. After 1-2-3 has measured all of the columns in the range, it moves the cell pointer to the WIDTH, which at that point will contain the width of the range

RETURNING FROM DOS

In the November 10, 1987, Spreadsheet Clinic, you presented a technique for keeping the message "(Type Exit and press [RETURN] to return to 1-2-3)" on the screen at all times after you have shelled out to DOS from within 1-2-3 using the /System command. I'd like to offer an improvement, shown in Figure 3.

Instead of placing the message on the same line as the traditional DOS prompt, this batch file puts them on separate lines. The first line contains the message; the second line contains the regular DOS prompt. The characters \$_ cause this split. Michael D. Kran

Castro Valley, California

tho off prompt (Type Exit and press (RETUR to return to 1-2-3)\$_\$p\$q od \lotus 123 od \ prompt 8p\$q

Figure 3: This batch file divides the DOS prompt onto two lines.

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■ SPREADSHEET CLINIC

Mr. Kran's suggestion is indeed an improvement. Mr. Jak Kamhi of Istanbid, Turkey, suggested still another enhancement, which is shown in Figure 4. This bach file uses NNSI escape sequences to reposition the cursor and write to the screen. Specifically, it writes the "UType Exit and press [REFIRN] to return to 12-23" message on the too line of the

echo off
prompt \$0:050[1]1f50[1m(Type Exit and
press (RETURN) to return
od (lotus
133
0d \

Figure 4: This batch file instructs DOS to write the message "(Type Exit and press [RETURN] to return to 1-2-3)" at the top of the screen whenever it presents a prompt.

screen whenever the DOS prompt is displayed. This is exactly where the message that 1-23 generates originally appears when you first access DOS. Mr. Kamhi has made the message bold to differentiate it from the other text on the screen.

To use Mr. Kamhi's technique you must

device=ansi.svs

in your CONFIG.SYS file, and that file must be in the root directory of the disk from which you boot your computer.

SECURING YOUR MACROS

I've discovered a good way to protect the macros in my 1-23- worksheets, First, 1 place all my macros at the upper-left corn of the worksheet—columns A and B and as many rows as it takes to accommod the macroscopic and the macro-containing rows off the post of the worksheet. Finally, 1 use the Worksheet Column Hide command to freeze the macro-containing rows off the worksheet Column Hide command to the column A and B. These actions hide the macroscopic and B. These actions hide the macroscopic macroscopic and the macroscopic macroscopic and decling rows and columns enerting and decling rows and columns.

To illustrate, suppose the macros in your worksheet occupy cells A1..B50. To protect them you would scroll the worksheet so that rows 51 through 70 were visible on the screen. After doing this, you would position the cell pointer in cell A52.

then issue the /Worksheet Titles Horizontal command. This command freezes rows I through 50 (the rows that contain the macros) off the top of the screen and freezes row 51 (the first row below the macros) onto the screen. (Unfortunately, there's no way to freeze rows off the screen without freezing at least one row onto the screen.) After freezing, you would use the /Worksheet Column Hide command to hide rows A and B.

rows A and B.
Peter J. Laszcz
Washington, D.C.

Mr. Laszci's method of protecting macros works as advertised, but it prevents your staing a portion of the worksheet specifically, the cells in columns C brough V in each of the frear rows). Since all 1-2-3 worksheets have more rows than you can possibly use, and 1-2-3, Releases 2 and 2.01, use a sparse-marix method of allocating memory, these unused rows won't limit the potential size of your Release 2 or 2.01 worksheets on su significant can 2.01 worksheets on su significant can 2.01 worksheets on su significant can 2.01 worksheets on su significant can

■ To protect the macros in my *1-2-3* worksheets, I freeze the macro-

containing rows off the top and hide the columns.

On the other hand, 1-2-3, Release IA, allocates memory to every cell in the active area. Consequently, Mr. Laszcz's method of protecting macros can reduce the usable capacity of your Release IA worksheets considerably.

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Medium	94 x 28	106 x 43	91 x 37	90 x 43
Small	106 x 33	128 x 43	106 x 48	120 x 43
They	128 x 33	160 x 58	160 x 60	180 x 58

SeeMORE works with 1-2-3-2.0 & 2.01 or Symphony 1.1, 1.2 & 2.0 on the IBM PC, XT, AT, PS/2 and composibles with GGA, MGGA, EGA, VGA, or Hercules graphics adaptar. Also works on Compaq and Toshiba gas plasma. Not copy mot

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User-to-user



Preventing software installation programs from modifying AUTOEXEC.BAT and CONFIG.SYS files; and making programs think you have less memory when they won't run.

LESS IS MORE

I recently ran across a program that would not run properly on a system in which more than 512K was installed. Although this sounds strange, I've run across other commercial and public-domain programs that have this problem.

One possible cause is the program's use of a signed compare and jump where an unsigned compare and jump in checking memory size is appropriate. You can address up to 512K with 19 address bits and need a 20th bit to go any higher. A signed comparison will interpret this as a negative value and report insufficient memory.

To fix this, I wrote the MEM512.COM program created by the MEM512.ASM assembly language code in Figure 1 or the ASIC CEM512 LAS As program in Figure 2 or the ASIC CEM512 LAS AS program in Figure 3 by the diagnostic code during boot-up. by the diagnostic code during boot-up. The same than 512K installed, the program sets it to indicate that only 312K in available size the performs a special reboot (RNT 19) that by-memory sking routine. The system memory-sking routine. The system of the Mills and promably except that it will think it has only 512K RAM.

If you run MEM512. COM on a system with 512K or less, it will display a message indicating the amount of RAM and then quit without rebooting.

The equate MEMSIZE is currently as-

signed the value 512. If you want to reduce the amount of memory even further, change the number there. Barry Herbert

Garland, Texas

```
TITLE 'MEM512 - limit memory size to 5128
   This program will limit the amount of RAM known to the operating system to 512K bytes.
       If more than 512K is installed in the system, the memory size variable is set to 512(K) and the system is rebooted without ROW diagnostics
       If the amount of RAM installed is less than or agual to 512K bytes, a message is displayed informing the user of the amount of RAM in the system. No further action is taken.
MEMSISE EQU
                                                      :Limit of memory size (in K)
   Macro to print a string of text and by '$'
         MACRO
                     STRING
                     DX,OFFSET STRING
AH,9
21H
   Macro to delay so user can read message on screen
DELAY
                     DELAY_1,DELAY_2
AL,5
CX, #FFFFh
           JNZ
                     DELAY 1
   Code sagment starts here
CSEG
                     CSICSEG, DSICSEG
          PRINT
                     STRIMSG
                                                      Display the "start" message
                                                      ;DS:SX <= ptr to man size variable
                     SX,13R
AX,WORD PTR (SX)
AX,MEMSIEE
                                                      ;AX <= memory size value
                                                      ;Jump if memory size LE 512K
```

Figure 1: MEM512.ASM assembly language code to create MEM512.COM program, which will trick DOS into thinking you have only 512K RAM. You may substitute other RAM amounts by changing the number following MEMSIZE EQUI and fixing the other text references.

USER-TO-USER

```
y sise is greater than 512K - set the memory size variable to 512(K) reboot the system without re-sizing memory
                      WORD PTR [BX], MEMSISE
                                                        |Set memory size to 512K
|Restore DS to "CSEG"
                                                        ;Tell user we're rehooting
                      198
                                                        ;Read bootstrap from disk; pass control
       mory size is less than or equal to 512x - tell user the current amount of memory and take no further action.
                                                        Restore DS to "CSEG"
        we ASCII value of mem size to output string. Hem size is in AX.
                      BYTE 16
          DR
HOV
                      KBYTES[2], AH
                      AX, 3030E
                          D PTR REYTES, AX
                      STEEMS
                                                       Display the message
           INT
                      29 H
                                                       PERIO DO
                      'Rebooting to set memory size to 512K',13,18,'8'
'System memory size is currently '
3 dup ('8'),'K',13,18,'5'
18,13,'WEM-512 tricks DOS into thinking '
                      'system has 512% or less of RAM.',13,18,'$'
SYTE_18 DS
                                                       ;Used by Divide instruction in MEM DK
           ENDS
END INIT
```

188 ' MEM512.BAS program to create MEM512.COM -- Barry Herbert

128 FOR B=1 TO 15:FOR C=1 TO 16:READ A\$:T=T+VAL("&H"+A\$):NEXT

198 DATA BA,98,81,B4,89,CD,21,BB,48,88,ED,B,BB,13,88,8B,1729
288 DATA 87,3D,88,82,76,LA,C7,88,82,88,E,1F,BA,58,81,B4,914
218 DATA 89,CD,21,B8,85,B9,FF,FF,E2,FE,FE,C3,75,F7,CD,19,2651

138 READ SIF SC>T THEN PRINT "ERROR IN LINE", B-18+188; END
148 T-8: NEXT: RESTORE: OPEN "MEM512.COM" AS \$1 LEN-1
158 FIELD \$1,18 D \$1; FOR B=1 TO 15: FOR C-1 TO 16: READ A\$
168 LERT D\$-CRR\$(VAL("\$H"+A\$)); PDT \$1: IF B=15 AND C=E THEN 188

118 E=4:CLS:PRINT "Checking DATA; please wait..."

178 NEXT:READ F\$:NEXT 188 CLOSE:PRINT "MEM512.COM CREATED" It's true that even some commercial software (like the Version 3.3 of WordSus') installation program) had problems with more than 512K, but these days, with so many programs needing 600K just to say hello, you probably won't need this utility mach, Still, if you're developing software, you have to make sure it runs on smallmemory systems, and his program makes it easy to similate them all. If you do creat several versions,

change both the value after MEMSIZE EQU and all the text references to 512K.

DISAPPEARING ACT

(Figure I ends)

I've read comments from several readers complaining about new software installation programs that after existing AU—TOEXEC.BAT or CONFIG.SYS files. One way to avoid these unwanted modifications is to change the attributes of the two files to Hidden. DOS will still access both files without complaint during boot-up, but it will not allow any programs to modify or delete them.

Brad Stephenson Jenison, Michigan

Changing the file attributes to "hidden" or "read-only" will prevent programs from overwing them. The SCRIPT file shown in Figure 3 will create four files called HIDE.COM, UNHIDE.COM, RO COM, and UNRO.COM. Type this

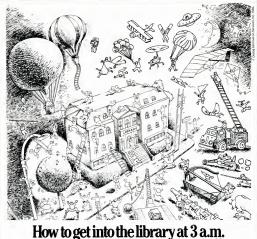
 Some software had problems with more than 512K, but these days, many programs need

600K just to say hello.

SCRIPT file using a pure-ASCII word processor. Be sure to leave the blank line above RCX and to press the Enter key at the end of each line, especially the last one. Then make sure DEBUG.COM, Version 2.0 or later, is handy and type

Figure 2: BASIC MEM512.BAS program to create MEM512.COM program, which will trick
DOS into thinking you have only 512K RAM.

DEBUG < SCRIPT



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USER-TO-USER

To hide CONFIG.SYS, just type

HIDE CONFIG.SYS

To unhide it later, type type the command

UNHIDE CONFIG.SYS To make AUTOEXEC BAT read-only.

RO AUTOEXEC.BAT

and to bring it back to normal, type UNRO AUTOEXEC.BAT

These four files use function 43h of INT 21 to first check the existing attribute byte and

```
N HIDE.COM
MOV BX, 88
INC BX
CMP BYTE PTR [BX], 20
JZ 193
```

MOV DX.BX INC BX CMP BYTE PTR [BX].D

JZ 116 CMP BYTE PTR [BX1.0 JNE 18B

HOV BYTE PTR [BX], 0 HOV AL, 8 MOV AH. 43

INT 21 OR CX.2 MOV AL. 1 MOV AH, 43

TNT 21 INT 28

RCX 2B

128 E1 FD N UNHIDE.COM

E 128 C9 81 N RO.COM

E 128 E1 FE

N UNRO.COM

Figure 3: SCRIPT file to create HIDE.COM. UNHIDE.COM. RO.COM. and UNRO.COM. Type it in using a pure-ASCII word processor. Make sure you leave a blank line above RCX and that you press Enter at the end of every line, especially the last one.

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USER-TO-USER

change only the bits that need modification. ORing the existing value with 1 makes it read-only: ORing it with 2 makes the file hidden. ANDing it with FE takes away the read-only attribute; ANDing it with FD unhides the file. Other attributes (system or archive) remain as they were.

Unfortunately, you can't use function 43 to change the attribute byte of subdirectories or volume labels, so this won't let you meddle with those.

Be careful when hiding files en masse. If you issued a command such as

FOR % in (*.*) DO HIDE % A you'd end up with a whole directory of hidden files. You won't be able to use a similar command to unhide them, since DOS won't see any files to unhide. You'd lhave to unhide all your files to thinkle. You'd have to unhide all your files individually, since widecards don't work with hidden files. The safess thing to do if you hide lots of files is first to create a masser file Issing all

 Making all your root directory files hidden may look interesting, but it can confuse other people.

the filenames, and then to put this master file in some other directory or on some other disk. If you're on drive C: you could use a command like

DIR > B:C-HIDDEN.LST

Making all your root directory files hidden may look interesting, but it can confuse other people who try to work with your system. Making them read-only will prevent other programs from changing (or deleting) them, but you'll still see them in nor-

mai DIR searches.

Some a wful installation programs
change things as they proceed. They may
rename a driver file on the original disk or
deltee files one they've copied them to a
hard disk. If the installation process is interrupted, or if is so dumb that it doesn't
know when something's gone wrong, you
may have trouble reinstalling thinss later.

A safer way is simply to create a ROOTBACK subdirectory one level down from the root and copy all your important root directory files into it. When something changes the files in the root directory, or if you somehow erase them, you can log into

you somehow erase them, you can le the root directory and type

COPY ROOTBACK

If you do try this, make sure that if you ever change your AUTOEXEC.BAT or CON-FIG.SYS files, you copy the new versions into NOOTBACK.

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ANOTHER APPROACH

Another clever way to prevent having software packages replace or otherwise modify AUTOEXEC.BAT files was submitted by William H. Dixon:

The AUTOEXEC.BAT file on my disk contains just one real line (after an initial ECHO OFF):

ECHO OFF

All it does is execute another batch file

SET NORMPATH=C:\Dos;C:\UTIL;C:\
PATH %NORMPATH%

SETPATH.BAT sets the path, then executes the STARTUP.BAT file, since its %1 replaceable parameter refers to the word STARTUP in the last line of the AUTOEXEC.BAT file.

The STARTUP.BAT file contains all the commands I normally would have placed in an AUTOEXEC.BAT file:

PROMPT \$P\$G PRINT /D:PRN /Q:32 CARDFILE C:\UTIL\CARDFILE.TXT DOSKEY

There are several advantages to this tech-

CTYPE /MA

SPEEDUP

nique:
(1) The AUTOEXEC.BAT file is easy to re-create if it is destroyed or inadvertent-

ly modified.

(2) The PATH command is in its own separate batch file, making it easy to change if directories are added or re-

(3) The SETPATH BAT file makes it easy to restore the default path if it has been changed.

(4) By creating a batch file like ADD-PATH.BAT,

PATH %NORMPATH%; %1

it's easy to add a new directory to the path temporarily, and then restore it later with SETPATH.BAT.

(5) If all memory-resident programs are removed by utilities such as MARK/RE-LEASE or INSTALL/REMOVE, running STARTUP.BAT restores those programs as they were at power-on time.

William H. Dixon Leesburg, Florida

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Power user



Coloring columns in dBASE; more ROUNDing errors; automatic uppercasing and simultaneous document editing in WordPerfect; printing multiple copies in Word.

ROUNDO FUNCTION, SQUARE HOLE Brian Danenberg's letter (Power User, August 1987) correctly identifies an anomaly in dBASE III's ROUNDO; function. Negative numbers are actually rounded to the next smaller integer, so that

ROUND(-5.5,0)=-5

whereas

ROUND (5.5,0)=6

This means that offsetting entries will not equate if the ROUND() function is used, but at least the result is predictable.

Clipper (Autumn '86) is in fact even worse than dBASE III in its implementation of the ROUND() function. Indeed, as documented in the table 'A Comparison of ROUND() Function Results,'' if you're using ROUND() with Clipper, you'd better rewrite your code.

Robert O. Banziger Batavia, Ohio

Among dBASE III, Clipper (Autumn '86), and FORBASE Plus, only FooRASE implements the ROUND), function correctly (in my opinion), and, as Mr. Banziper's ableb shows, Clipper's results are so bad you shouldn't even be using the ROUND!) function. Of the 2000 ".5" numbers between 1000.5 and 999.5, only 28 return correct results with this program. The same anomalies occur using Clipper's STRI function for roundine.

Nantucket is aware of the problem, and has corrected it in the new Summer '87 release (the upgrade for which is free—how nice!). In the new version, all numbers round so that positives and negatives will offset. If you must continue using Autumn '86 for some reason, the Winter '87 Nantucket News suggests a workaround:

rounded=(INT(x*10+.5))/10

Unfortunately, this formula produces
the same imperfect results as does

A Comparison of ROUND () Function Results

	correct	dBASE	Clipper
ROUN(-9.5,0)	-10	-9	-9
ROUN(-8.5,0)	-9	-8	-8
ROUN(-7.5.0)	-8	-7	-8
ROUN(-6.5,0)	-7	-6	-6
ROUN(-5.5,0)	-6	-5	-5
ROUN(-4.5,0)	-5	-4	-4
ROUN(-3.5,0)	-4	-3	-3
ROUN(-2.5,0)	-3	-2	-3
ROUN(-1.5,0)	-2	-1	-1
ROUN(-0.5,0)	-1	0	-1
ROUN(+0.5,0)	1	1	1
ROUN(+1.5.0)	2	2	1
ROUN(+2.5,0)	3	3	3
ROUN(+3.5,0)	4	4	3
ROUN(+4.5,0)	5	5	4
ROUN(+5.5,0)	6	6	5
ROUN(+6.5,0)	7	7	6
ROUN(+7.5,0)	8	8	8
ROUN(+8.5,0)	9	9	8
BOUN(+9.5.0)	10	10	9

dBASE—all positive numbers round up while the negative numbers also round up (because of the ''+ 5'').

In Clipper's defense, the problem originates in Lattice C, with which Clipper is compiled. Lattice acknowledges that the errors arise inside the Lattice library when manipulating floating-point bits ("It's a tricky problem—other areas are involved") and is working on it.

In the meantime, to get correct results, you need to employ Danenberg's technique of using the ABS() function.

Incidentally, I've had a number of letters defending dBASE's philosophy from a mathematical point of view. I still prefer the Lotus approach, however, because I want the dollars and cents of offsetting entries to offset.—Brad State.

COLOR PRINTING FROM DBASE

Even without using ABASE programming you can send color instructions to your printer using simple Escape sequences. I wanted different columns of my report printed in different colors, so with my Eppson FX-100 and assuming a .DBF with fields called Name, City, and Country, I entered

red=CHR(27)+CHR(1) green=CHR(27)+CHR(2) black=CHR(27)+CHR(3)

Then I typed

LIST red+name, green+city,; black+country TO PRINT [We have broken the above LIST command into two lines to fit the magazine's mar-

Avery desktop Laser Printer

POWER USER

gins. When you enter it yourself, remove the semicolon and combine the two lines into one—EdJ If you wish to highlight only certain records, you could use the IIF() function or actually add the Escape cuences to the fields of these records. If you wanted all records from New York highlighted, you could enter

REPLACE ALL City WITH red+City+bleck; FOR State="NY"

[Again, remave the semicolon to make the above a single line.—Ed.] Bear in mind that the Escape sequences consume space in the field, so the field must be long

enough to avoid truncation.

Hassan El Meligy Cairo, Egypt

Even if you don't have a color printer, you can use Mr. El Meligy's techniques to bodidace or underline. See your printer manual for the appropriate Escape sequences. Just make sure you always turn off any enhancements you turn on, and remember that printing will be correspondingly slower.

Mr. El Meligy is correct that a dBASE character field can hold Escape sequences. This can be useful in emphasizing special records. The drawbacks: the field will no longer SORT or INDEX normally; there is a great danger of truncating the field; and you must remember to remave the Escape sequences later.

You can also implant Escape sequences in REPORT FORMS and LABEL FORMS.

—Brad Stark

CAPSTART

<Alt-c>

<Ctrl-F10>

have a habit of not pressing the Shift key hard enough after a period, so I end up with a lowercase letter at the beginning of

the next sentence. Rather than cure the habit, I found it easier to write the macro in Figure 1. It simply capitalizes the first character of every word immediately following a period.

Yvonne Tallini Weedsport, New York

I modified Ms. Tallini's original macro to use davanuage of WordPerfect's conditional chaining. It's easy enough to transition of the condition of the condit

BOTHDOCS

I often want to cell two documents at once, and so I've writen the BOTHDOCS macro shown in Figure 2. It displays the current directory and lets you select a file from it, then does the same for a second document. It uses the Ctrl-Pglr and observed the growing the production of the same for a second light around with the errow keys high the control with the errow keys high the control with the errow keys high the control with the errow keys and the fact of 2.0 to use this macro, however, as previous versions don't have the Ctrl-Pglr feature.

There are two Down commands in the macro definition. Their purpose is simply to ensure that when you're defining the macro you don't try to retrieve a subdirectory. If you're in the root directory when you define the macro, you don't need those two lines at all.

<ctrl-F10> Begin macro definition <Alt-c> call it Alt-C <F2>,<F2> search for a period <ctrl-Right> Jump to the start of the next word <Alt-F4> Block on <Right> Mark the first character <shift-F3>1 Switch it to uppercase <Alt-F4> Block off

 $\textbf{Figure 1:} A \ \textbf{WordPerfect} \ \textit{macro that automatically upper cases the first letter in a sentence}.$

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call this macro again

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POWER USER

<Ctrl-F10> Begin macro definition BOTHDOCS Name it BOTHDOCS

<Ctrl-PgUp><CR><CR> Take user input
1 Retrieve the file
<shift-F3> Switch documents

1 Retrieve the file <Ctrl-F10> End macro definition

Figure 2: This WordPerfect 4.2 macro permits you to edit two documents simultaneously.

YOU LOOK HOREJED, YOU
MATTER TOO LOVE OF HOME AND A SOON AS YOU STATT TURNING WP, Just use the
COMMAND AND A SOON AS YOU STATT TURNING WP, JUST USE THE
COMMAND AND A SOON AS YOU STATT TURNING WP, JUST USE THE
COMMAND AND A SOON AS YOU AND A SOON

WP /H=BOTHDOCS

This executes the BOTHDOCS macro as soon as the program starts.

—Neil J. Rubenking

MULTIPAGE PRINTING WITH WORD When Microsoft Word prints multiple copies of a page, each copy gets reformated every time from scratch. With HP Laserlet this is unnecessary, since the printer can produce multiple copies far faster than Word can. The HP Escape sequence for

this is Eac&lnx

where N is a number from 1 to 99. When in Word, you can enter the Escape character by holding down the Alt key and typing 27 on the numeric keypad. You can place the command anywhere on a page. For example, the sequence

Esc&125X

would print 25 copies of the page in which it appeared.

For real elegance, however, put this code in its own paragraph, format the paragraph with a line spacing of zero, then place it in the glossary with the name MULTI. That way you can simply pop it into any document as needed, without disturbing the page formatting.

Richard W. Cobb

Stormville, New York
There's actually an even more sophisticat-

ed solution. Rather than enter the command in the glossary as text, enter it as a

macro. Then use the pause command to have the macro stop for you to enter the number of pages to print. In Word's syntax, the macro is

<Esc>\$1.pause.X<esc>fp<down 2>0<enter>

Enter the first Excape by holding down the Alt key, ping 27, and releasing the Alt key, It will show up on-screen as a small arrow pointing to the left. Enter the second Excape as usual—hitting the Exc key (reading the macro in learn mode, or oping <Exc> if creating it as teat. The chevrous falso called guillenests or European quotes—Ed.] surrounding 'pause' are typed by holding down the Alt key and sping for the left cherron and I to produce the right cherron.

By substituting the appropriate commands you can use this trick on any laser printer with multipage capability. You! We impressed by the difference in speed. Alax, you will have to collate the output anomably, since the printer will print anomably, since the printer will print anomably, since focash gage before moving on the next. On my Coann LBP-811, using Metro Software's LaserTwin to emulate the HP, entering the command on page I maintained multipage printing throughout the document—M. David Stone

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LANGUAGES



Named constants in Turbo Pascal to make INLINE code easier to read and write; bitmaps to decrease a C program's memory requirements; and a BASIC program that does a warm boot.

BASIC

WARM BOOTING FROM BASIC In PC Tutor, June 23, 1987, there was a discussion of how to force a PC to perform a warm boot. However, in my case, I needed to be able to do this from within a BASIC program. By disassembling WARMBOOT.COM, I was able to isolate the steps required to accomplish this.

the steps required to accomplish this.

The BASICA program listing (Figure 1) will cause a warm boot when added to a program and then run. A cold boot is even easier to do, although it will cause a longer delay due to the PC's memory check. To convert this routine to perform a cold boot, remove lines 30 through 130, change the ARRAY(2) in this 20 to ARRAY(2) and the 10 this program of this program of this program of the 10 this program of this program of

then change the FOR counter in line 200 to FOR 1 = 0 TO 4. Dr. Thomas G. Burnakis

Southgate, Michigan

To convert this routine for use with Ouick-

BASIC or Turbo Basic you will have to use CALL ABSOLUTE, which is equivalent to BASICA's CALL command. CALL ABSO-LUTE is built into Turbo Basic directly; however, you must first use

DEF SEG = VARSEG(ARRAY(0))

before the POKE and CALL statements, to
make the array's segment the current default.

In QuickBASIC 2.0, ABSOLUTE is an external routine contained in the file

USERLIB.OBJ, though in later versions it is in its own file named ABSOLUTE.OBJ. Regardless of which version of QuickBA-SIC you're using, this object module must be linked to your program after it has been combiled.—Ethan Wine.

C

COMPRESSING WITH BITMAPS

When the elements of a large array are going to be used as flags to indicate yes/no or on/off status, the individual bits of each byte can be used to reduce memory over-

On IBM PC-class machines, a byte is 8 bits, which means a character array can track eight times as many elements for be eight times almost eight times as many elements for a leight times. A single repending on your needs). Each element of a list can be represented by a single bit, with every 8 bits stored in a single array element. When an element is to be set (tumed ON), the position of the character containing the bit is found and the bit set to 1. Resetting the full full full form of the character containing the bit is found and the bit set to 1. Resetting the full full full full forms of the character containing the bit should be a set to be set back to 0.

BITTEST.C is a small program that demonstrates the use of these bit manipulation routines.

S. Manipoopathy Bangalore, India

Bitmaps and bit manipulations are not new. But C makes bit manipulation so easy that it's a sin not to take advantage of it, as Mr. Manipoopathy's program, shown in Figure 2, so aptly demonstrates. I can think of a lot of times when bitmaps would

```
' Machine language warm reboot procedure
28 DEFINT A-Z: P=8: I=8: J=8: DIM ARRAY(7)
36 DATA &HBS
                          :REM This is the hex code
48 DATA &H48
                          :REM for the warm reboot.
58 DATA &H88
                          :REM It first goes to the
68 DATA &H8E
                          :REM memory address 8848
78 DATA SHD8
                          :REH and places 1234 (hex)
88 DATA &HC7
                          :REM into memory. Then it
98 DATA &HR6
                          :REM branches to FFFF: 8888,
100 DATA 5H72
                          IREM the address where the
110 DATA SHOP
                          TREM CPU begins to execute
120 DATA 6H34
                          :REM instructions after a
138 DATA &H12
                          :REM power on. From here
148 DATA SHEA
                          :REM the PC's BIOS jumps
158 DATA SHEE
                          :REM to the start of its
168 DATA SHEE
                          (REM diagnostic routines.
178 DATA SHFF
188 DATA SHPP
198 REM
280 P-VARPTR(ARRAY(8)); FOR I=0 TO 15; READ J; POKE(P+I), J; NEXT
```

218 SUBRT-VARPTR(ARRAY(8)): CALL SUBRT

■ LANGUAGES

```
* tests bit-map routinee
 include<etdio.h>
finclude man.h>
finclude PcMag.h"
                                             /* etenderd definitions
ddefine BITMAP_SIEE 1824
#define NUM BITS 8
#define MAXVAL (BITHAP_SIZE+NUM_BITS)
                                   memoet(bitmap,8,size)
#define Bmap init(bitmap,eize)
unsigned char bitmap[SITMAP SIZE];
                                             /* cen track 8898 elemente */
main()
    int n,i; linebuffer[188];
    Beap init(bitmap.BITMAP SIZE)/
                                            /* initialize the bitmap to 8
    while (TRUE)
        printf("\nEnter a number to put in the list & <RETURN> ("E to go
on):\n*
        if(|gets(linebuffer))
        All becommunity;
i = stoi(limebuffer);
if(i < 8 | [ i > MAXVAL)
printf("nonly numbers from 8 to td ere velid in this demo", MAXVAL)
             setbit(bitmap,i);
    while(TRUE)
        printf("\mEnter e number to EXCLUDE from the list & <RETURN> ("E to go
on):\n*
        if(|gets(linebuffer))
        breek;
i = etoi(linebuffer)
        if(1 < 8
            | < 8 | | i > MAXVAL)
| printf("\nOnly numbers from 8 to %d ere velid in this demo", MAXVAL)
             resetbit(bitmap,i);
    printf("\nThe included numbers are:\n");
    for(i = n = 8: i < MAXVAL: i++)
          f[isbitect(bitmap,i))
             n++;
printf("%3d %c",i, ((n % 13) 7 ' : '\n') );
    printf("\nThet\'e it");
     /* setbit() - turne ON bit n in bitmap
eetbit(bitmap,n)
cher *bitmap;
int
        n/
    bitmap(n/8) = (1 << (n % 8));
    /* unsetbit()
                    - turne OFF bit n in bitmap */
resetbit(bitmap,n)
cher *bitmap;
        n
    bitmap[n/8] &= (~(1 << (n % 8)));
/* imbitmet() - returns TRUE if bit n ie ON in bitmap, else returns FALSE */
isbitset(bitmap,n)
obar *bitmap;
        ni
    return (hitman(n/8) & /1 << (nk8)));
```

Figure 2: BITTEST.C demonstrates the use of bitmaps and bit manipulation routines to reduce memory overhead.

have gone a long way in improving the memory requirements of one of my programs: tracking previously asked questions in a triviu gune program or u list of record numbers from a database selection, for example. In fact, a stuall model program (limited to 55,335 bytes of data space) can easily track over 250,000 elements of a list usine a 32K bitmus in a 32K over

menus of a tos using a 3-x numap, where we will be the inaction use bilingus, make sure that the inactionau marbor of elements being tracked does not exceed a while eight times the number of bytes in the bitmap; otherwise, you're sure to get "unperdictable results" —u program crush. I did this, und the "bing" disapposerted once I reulized my error und increased the size of the bitman.

BITEST C uses u 1k bitmap to truck over 8,000 elements. You can adjust this if you wish, but remember that data space in a small model program is limited, and most completes require the "Huge" memory model to be used to create un urray larger than 6k. You cun tudo declare u "Huge" pointer and allocate over 64K from the fur hearn.

The Bitmap initialization routine (a nucro cull to inemset) should always be called before commencing culls to bitmap routines. This insures that the bitmap is properly initialized to all zeros.

FLIPPING BITS The sethit i function urans on a specific bit in the bitmap. To do this, if first calculates which byte in the bitmap to do this, if first calculates which byte in the bitmap that is the bitmap to the bitmap that is the bitmap to the bitmap that is the bitmap to the bitmap that is the

Next, sethit) finds the individual bit in the selected by wia the Cmodulus operator, which returns the remainder of a division operation. Calculating the remainder of Avided by 8(7 % 8 in a C modulus) returns 1, or the seventh bit of byte 0. bit number 24 would be the zeroth bit of byte 3 (24 % 8). Fortunately, setbit() performs this automatically for us.

Finally, setbit() must turn that particular bit ON. It does this by taking the value of 1 (or 00000001 in binary) and shifting it left by the bit number. Bit 7, for instance,



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(bit 0 of byte 3) 24

Turning On Specific Bits Byte number 76543210 76543210 76543210 76543210 Bit numbe Before 00000000 00000000 00000000 00000000 After setblt(bitmap,7) 10000000 00000000 00000000 00000000 After setbit(bitmap,24) 00000000 00000000 00000001 00000000

7 (bit 7 of byte 0) The first 32 bits of a bitmap before and after bits 7 and 24 have been set.

results in 10000000 (1 shifted left seven times). Note that the bits are referred to here on a right-to-left basis, so that bit 7 is the seventh bit from the right side of each byte (beginning with 0). This creates a mask that is used to turn

on the appropriate bit via the bitwise OR operation. An OR operation always returns TRUE (or 1) if at least one of the two operands is TRUE. So. ORing a bit set to I (10000000) with a bit set to 0 (00000000) will always result in a 1 (10000000)

The table "Turning On Specific Bits" shows the first 32 bits of a bitmap before and after bits 7 and 24 have been set.

To reset a bit in the bitmap (i.e., to turn it OFF), the same steps are taken in resetbit() with the exception of the OR operation. Instead, a logical AND is used (which returns FALSE unless both operands are TRUE). To insure that the appropriate bit is turned OFF without affecting the other bits in a byte, a mask must be created that contains a 0 in the appropriate bit. In other words, to turn off bit 7, we must create a mask the opposite of 10000000-that is. one that looks like this: 01111111.

ANDing a byte with this mask will turn bit 7 OFF without affecting the remaining bits. Other bits that are ON will stay ON. while bits that are OFF will remain OFF. That's the nature of the AND operation and this particular mask.

To create this second mask, the complement of the first mask is used. Designated by the tilde (*), the complement operator reverses all of the values of the bits in a byte. So while ORing a bit with a 1 will | Figure 3: Demonstrating the use of named constants for INLINE opcodes.

TURBO PASCAL

CLARIFYING INLINE LISTINGS

Using hex constants in INLINE code destroys the readability of the code and invites errors if you type in a wrong number. The solution is to use named constants to represent the instruction mnemonics. As an example:

INLINE (\$8B/\$86/stack_var);

loads the value of the parameter "stack _var" into the AX register. If you declare a CONST MOV_AX_BPdisp = \$868B, you can write this instead:

(By my convention, a single underscore separates the portions of the instruction. and a double underscore indicates indirec-

Note that integer words in the 8088/8086 are stored in byte-reversed order, so \$1234 would appear as \$3412. Also, in Version 2 of the compiler, references to constants generate a 2-byte value even if the constant defines only 1 byte. That is the reason for the value of the ES override instruction being \$2690. The \$90 is a NOP (no operation), to pad the constant out to 2 bytes. Under Version 3 you may simply use \$26.

The listing in Figure 3 demonstrates this technique as used to create a set of routines for incrementing and decrementing a pointer, and adding to and subtracting bytes from a pointer.

Don Sclesky Cambridge, Massachusetts

When I write INLINE code, I often have to get out an 8088 reference manual or leave

written as macros, too, depending on how much "in-line" code you want scattered all over your program. Either way, the functions in BITTEST.C can reduce your list tracking data overhead considerably. -Richard Hale Shaw

force it ON. ANDitte the bit with the com-

turus TRUE or FALSE depending on

whether the appropriate bit is ON or OFF.

It accomplishes this by ANDing the bit with

the original mask and returning the result

of the AND operation. This will only return

prompts you for a series of numbers to in-

clude in the list, which are added to the list

via setbit(). Then it prompts for numbers to

be excluded from the list and resets them

via resetbit(). Finally, it uses isbitset() to

print the list of included numbers on the

Bit manipulation routines can also be

To test these functions, BITTEST.C

TRUE if the bit has been set.

screen.

The remaining function, isbitset(), re-

plement of 1 (or 0) will force it OFF.

- 1	Es Override		(ES Override of instruction)
,	LES DI BPdisp	= \$BEC4;	(load addr on stack into ES:DI)
;	HOV AX BPdisp	= \$868B;	(move integer on stack to AX)
2	ADD DY AX	- \$6561;	(add AX to [DI])
ш.	SUB DI AX	- \$6529;	(subtract AX from [DI])
Л.	INC DI	= \$45FF;	(increment [DI])
,	DEC DI	- SUDFF:	(decrement [DI])

PROCEDURE ptr_incr(VAR Pntr); (* increment a pointer *)

INLINE(LES DI BPdisp/Pntr); (load addr of variable in ES:DI)

How Farsighted Executives Are Using Their PC's For The Fun Of Profit.

Director of Planning

ICPrinary Co.

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INLINE(ES Override/INC DI); (increment variable ES:[DI])

PROCEDURE ptr_edd(VAR Pntr; bytea : Integer); (* edd a number of bytes to a pointer *)

INLINE(LES_DI_BPdiap/Fntr); {load addr of variab INLINE(NOV_AX_BPdiap/bytea); {mov length to AX} INLINE(ES_Override/ADD_DI_AX);{add AX to ES:{DI]} (load addr of variable in ES:DI)

PROCEDURE ptr decr (VAR Pntr); (* decrement a pointer *)

BEGIN INLINE(LES DI BPdiep/Pntr): (load addr of veriable in ES:DI) INLINE(ES Override/DEC DI); (increment variable ES:[DI])

PROCEDURE ptr_aub(VAR Pntr; bytea : Integer); (* aubtrect a number of bytes from e pointer *)

BEGIN INLINE(LES DI Brdisp/Fntr); (load addr of variable in ES:DI)
INLINE(NOV AX Brdisp/bytes); (mov length to AX)
INLINE(ES_Override/SUS_DI_AX); (subtract AX from ES:[DI])

(Figure 3 ends)

Turbo Pascal and use DEBUG. In DE-BUG I assemble the instructions I need and note the actual bytes that represent them. Either way makes writing INLINE tedious. Mr. Selesky's method makes so much sense, it's a wonder we haven't seen it before. Just create an \$Include file of constants for common opcodes and then refer to them by name in your INLINE code, Remember, untyped constants don't take up any code space. They're strictly for your benefit.-Neil J. Rubenking

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PC TUTOR



Understanding the sparsely documented SHELL statement and its relation to the three basic DOS files can let you select the command processor that runs your system.

THE SHELL STATEMENT

The SHELL statement is probably the most neglected, misunderstood, and poorly documented command available under PC-DOS Throw in version variations and add to this the confusion created by similarly named commands in many languages, and you have a recipe for obscurity. To help demystify SHELL and help you optimize the performance of your system. I'll go over the syntax, defaults, undocumented options, and alternatives in this column. To properly understand SHELL. however, it's well to begin with a brief review of the different programs that make up DOS and that handle the system loading, or boot, procedure.

As sold by IBM, DOS consists of a pair of floppy disk share contain approximately 50 separate files. Most of these files are unities, which flow calls external commencements of the containing the conta

The curious among you have probably just returned from taking a directory of a system disk. You'll have noticed that, while COMMAND.COM appears in the listing, the other two files do not appear. Because of limitations in the boot procedure, these two files must always be the first two (albeit invisible) entries in the directory. (I'll save the discussion of why this is out ill someone asks.) To protect these files from being moved or corrupted, they have been given special properties or attributes, that prevent normal file functions from affecting them. Specifically, BBMIO.COM and BBMIOS.COM are marked with the Hidden. System, and Federal on the Hidden special process from the form being listed by the DRC command.

The Hidden autribute makes the file invisible to most file operations, including DIR, COPY, DEL, and ERASE commands. The System autribute has about the some effect as Hidden, A file that has the artibute Read-only is "protected": any attempt to crase or copy over the file results in the error message, "Access Denied." Scary, huh? Of course, there or many sulfits that will let you get at and manipulate these files and even change their attributes. These Persold's ATTR

■ To perform any useful work, the OS shell must be capable of processing user commands and loading other application programs. COM (Programming/Utilities, PC Magazine, June 10, 1986) is an excellent tool for checking and changing file attributes.

While its exact contents vary in density among different versions of DOS, IBM-BIO.COM (IO.SYS) generally contains the low-level hardware interface that is specific to the P.C. The routines that handle the keyboard, printer, display, clock, and boot device are contained in this IBE and have the responsibility of insulating the remainder of the operating system (OS) from the hardware.

The DOS application program interface (API), or kemel, as it is frequently called today, is comained in the file BBM DOS COM (MSDOS SYS). Presented to the programmer as a hardware-independent interface, this file contains the system-level routines normally associated with DOS. All the famillar file, disk, and video INT 21h functions are processed by this module.

When your PC is boosed and the now your file, IMBO and IBMODS, have been successfully loaded, the operating system is, in Secret, complete. It has all the necessary routines in place to service an executing application. The only shing it does not have is a user interface. This is a specialized program that allows the conenter commands and access system resources. Known as the command processor, or shell, it is simply a user interface to the operating system, not the operating youen taelf. The familiar, adjust com-

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■ PC TUTOR

shell must be capable of processing user commands and loading other application programs. COMMAND has the ability to process a number of internal commands, such as DIR and CLS. It can also load and execute other programs or be run as a program itself.

The routine that processes the CON-FIG.SYS file allows you to specify the toplevel command processor that DOS will use. By including in your CONFIG.SYS file the statement

SHELL=[d:][path]filename[.ext]

you can cause any executable program to be loaded as the top-level shell. (Chances are, you've seen the SHELL statement with some other options, but these are really arguments to COMMAND, and not part of the SHELL syntax.) Before you start reconfiguring your system disks. however, note that COMMAND.COM is a lot smarter than it lets on. Even renamed. it still knows that it's called COMMAND, and will insist on finding itself under that name. Attempts to caiole DOS versions prior to 3.2 to load COMMAND.COM from other than the boot device will also fail, as COMMAND checks for the reloadable copy on the boot device.

But should you desire, you can, for example, specify DEBUG.COM as your shell

If you choose to experiment with alternate shells, be careful. Because a bad CONFIG.SYS file can keep your computer from finishing a boot, always keep a bootable diskett handy. Bear in mind also that most programs aren't written to be shells, and if you exit them, you'll find yourself with a hung computer.

USING COMMAND.COM I noted previously that the SHELL statement takes only one argument: the name of the program to load, along with an optional drive specifier and path. But when COMMAND is used as the shell, it offers several other options, depending on the DOS version used. Fisure I below shows the full syntax.

when you're using COMMAND as the shell. The /C, /P, and /D options have been available under all versions of DOS since 2.0. The /F and /E options were introduced in Version 3.1.

The first argument to SHELL is a file specification that indicates where the initial copy of COMMAND.COM can be found. Note that this can be any valid path on any valid device that exists and contains a copy of COMMAND.COM at the time the SHELL statement is executed. It is possible, for example, to create a device driver that would make a ROM appear as a read-only disk drive and specify that device as the source for COMMAND.COM. As long as the DEVICE is initialized before the SHELL statement is executed, and COMMAND.COM can be found on the device, everything will be fine. The initial device may also be a network drive if DOS can recognize the network as active before the SHELL statement is processed.

The second drive and path is an optional argument to COMMAND that specifies where it should look when it needs to reload itself. The need to reload has nothing to do with the operation of the SHELL statement. COMMAND was designed to split itself into a resident and a transient portion in order to leave more memory free for execution of applications. Large programs may overwrite the transient portion, located in high memory, causing COMMAND to attempt to reload that portion when it regains control. If COM-MAND.COM cannot be found, the message "Insert disk with COMMAND.COM in drive x:" will appear, where x: is the drive specified in the second argument, If this argument is not specified, then it defaults to the location of the original COM-MAND. Again, the only restrictions are that the device must exist and that a copy of COMMAND.COM must be on it when the SHELL statement is processed. Unfortunately, this precludes specifying a RAM-

disk.

The drive and path from this argument are fed into the environment in the form of

SHELL=[d:][path]COMMAND[.COM] [d:][path] [/C|/P[/D]][/E:n][/F]

Figure 1: The full syntax for the SHELL statement, when the default shell COMMAND is used, is shown above. Explanations and restrictions of the arguments are given in the text.



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PC TUTOR

TOEXEC BAT

the COMSPEC parameter, which COM-MAND uses to find itself, and which many other programs use to find the shell. To examine the COMSPEC variable after booting, enter SET, with no arguments, at the command line. If you cannot set this variable to your liking in the SHELL statement, you can always set it in your AU-

The switches accepted by COMMAND .COM vary according to the DOS version. so we'll discuss the common ones first. The C (Command) switch is documented. It tells the newly loaded COMMAND to perform the internal command named or to load and execute the program that follows on the line. When the command or program is finished. COMMAND itself will terminate and return control to the calling program.

With a little thought, you can see why this is the one option that should not be used in the SHELL statement. The part of DOS that processes the CONFIG.SYS file loads COMMAND and passes control to it. But because you used /C, COMMAND will automatically terminate and return control. The problem is, DOS doesn't want it and doesn't know what to do with it. The result is an immediate need for a cold boot

The /P (permanent) switch tells COM-MAND that it should make itself permanent. The effect of this is to set some internol flags that make this first version of COMMAND behave somewhat differently. First, a flag is set that tells this copy to ignore the EXIT command (that would hang the machine). It also sets a flag that tells COMMAND to find, load, and process the AUTOEXEC.BAT file. If, sometime during your normal DOS session, you execute a second COMMAND and use the /P switch, it will become permanent and reload AUTOEXEC. Needless to say, this will waste memory, will gain you nothing, and should be avoided.

The /D (Don't execute AUTOEXEC) switch, when used in combination with the P switch, disables the automatic execution of the AUTOEXEC BAT file.

The IF (Fail) switch first appeared in Version 3.1 and appears to be a poorly written patch to the original 3.0 code. When specified, it causes the critical error handling code in COMMAND to automat-

ically fail any error. The "Abort, Retry, Ignore" message is still displayed, along with the system's reply, but the user is not required to enter anything.

This option might initially seem useless, but I can think of a few situations where it would come in handy. If you are operating your PC from a remote system. or automatically, via batch file, and you accidently cause a critical error, this option will allow the PC to continue to function without the need for an operator at the keyboard.

The /E (Environment) switch arrived in Version 3.1. as well. Like the /F switch, it appears to be a hasty patch to the 3.0 code. It is undocumented and unsupported, but it does work consistently. For Version 3.1 only, the syntax is /E:nn where nn stands for the number of 16-byte paragraphs of memory to be allocated for the size of the environment. The valid range is from 10 to 62 paragraphs, inclusive. The default is 10 paragraphs, or 160 bytes. This switch is valid for only the first COM-MAND that is processed. Subsequent loads will ignore it.

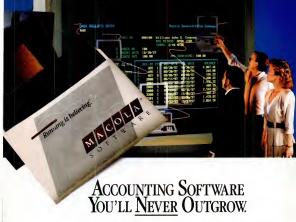
In Versions 3.2 and later, the /E switch routine was rewritten and the syntax was changed. The argument is now specified in bytes and has a valid range of 160 to 32768 (32K). The default environment size is, again, 160 bytes. Unlike previous versions, the /E switch is now also allowed with secondary processors.

EVERYTHING OLD IS NEW AGAIN Now that all the secrets of the SHELL statement have been revealed, two thoughts should spring to mind. The first is

that if you're still using an older version of DOS you're past due for an upgrade. The second is, why hasn't anyone written a replacement shell for DOS?

ASK THE PC TUTOR The PC Tutor solves practical problems

and explains points of general interest about using your hardware and software more productively, and answers basic questions about DOS and systems in general. To see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016. We're sorry, but we cannot answer questions personally.



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CODENOLL FIBER LAN SPEED

In your recent review of fiber LANS, "Making Connections The Who, Why, and How of Fiber coptic LANS," PC Magazine, January 12, 1988), you reparker, January 12, 1988), pour period to Codenoli S Codenet fiber LAN had a slower transfer rate between the network and the server than a network using SCOM's cards and coastia caleb If, as you state, the Codenoli cards are electronically the same as the 3Gon cards, what casses are as 62 Gon cards, what casses are she 3Gon cards, what casses are she 3Gon cards, what casses are she 3Gon before the source of the same as the 3Gon and she will be sourced to the same as the 3Gon and she will be sourced to the same as the 3Gon and she will be supported to the same as the 3Gon and she same as the 3Gon an

Denver, Colorado

The difference between the transfer times reported for the Codenoll and 3Com systems comes from the use of the 5Com Etherlank Plus card in the network server, no from the network media. The Etherlank Plus card has its own on-board processor and message whilers. It does a better job of moving data between the network and the server.

The cards we received from Codenoll were its version of the less-capable 3Com Model 3C501 cards. We used one of these Codenoll cards in the server, and the overall performance suffered. We could have added an outboard Codenoll fiber modern to an Ether-Link Plus card and gotten fuster performance with fiber advantages, but typically we don't mix and match products from different manufacturers except to test compatibility.

Our LAN benchmark tests load networks very heavily. I'm sure you wouldn't notice the difference between Ethernet coaxial and fiber performance in typical installations, but if you want equal performance, put a smarter card on the server.

SYSTEM/36 DATA TRANSFERS

In response to Vivek Chanmugan of Austin, Texas (December 22, 1987), there is an easy way to transfer data from the IBM System/36 to Lotus 1-2-3 on a PC. If the program you are operating on the System/36 can print your data to the screen or to the System/36 print queue, the \$225 On-Demand program, from Brainwave Computer Products (tel.: (714) 969-1327), can help. This program runs on the PC and captures data from the System/36 terminal screen to a .PRN file, which can then be imported to 1-2-3 or just about any spreadsheet or database program. It is not necessary to purchase a file transfer program for the System/36.

I use the program on an IBM PC AT with an IBM 5250 Emulation Adapter to gather monthly accounting data for use in

■ DOS 3.1 brings in the record- and file-locking calls that applications need to allow multiple, simultaneous access to the same data files.

budgeting and financial analysis without the help of data processing personnel or programmers. Brainwave has different versions of OnDemand that work with other 5250 terminal emulators, as well as 3270 versions

> Matt Claflin, C.P.A. Medford, Oregon

DOS VERSIONS ON A LAN

We recently started installing hardware and software for a Coron network. One of the problems I have come across is memory consumption on the workstations. 3Com networking offware will not run under any version of DOS prior to 3.1. mation on the different DOS versions, the company said I should go buy a book. I need to seem the metric population of the different DOS versions, and I need to tell users who are using DOS 2.1 what will users who are using DOS 2.1 what will cover the company said I speak their meshenes. Can would be supported their meshenes. Can would be supported their meshenes.

Peter Norloff Fairfax, Virginia

Mr. Nordff, you have a move everyhow, over to DOS, Version 3.1 (or 3.), for here good reasons, but none of these reasons will be highly visible to your users. Most important, DOS 3.1 brings in the record- and file-toking calls that applications need to allow multiple, simultaneous access to the same death files. I you want to share files, you need this capability in every workstation. Second, Version 3.1 includes network path recognition in the form of \Secret Vaccounthy appathes.

■ CONNECTIVITY CLINIC

This allows the use of application files, even on complex networks. Finally, it gives you the ability to address more than six drives.

Whatever version of DOS you select, we

strongly recommend that you put the same version on every networked station. If users swap versions of COMMAND.COM, you invite those frustrating ''Incorrect DOS Version'' error messages.

MULTIUSER VERSUS IAN

The speed, power, and relatively low cost of 80386-based PCs make them excellent LAN servers or multiuser hosts. I would like to see PC Magazine compare LANs based on 80386 servers against PC-MOS or UNIX/Xenix-based 80386 multiuser systems. Let's see what the comparison shows on cost, system performance, and other criteria. I am particularly interested in the small-office environment with eight to ten stations.

Jim Trudeau Chico, California

I agree with you that we should extend our evaluations to multiuser systems, but since I don't have the objective data to answer your question at this time, let me tell you what I think is pretty clear when comparing LANs against multiuser systems.

As far as cost goes, if you must go out and buy new PCs for every LAN workstation and if you'r egoing to buy an 80386-based server anyway (your specification), the multiuser system is considerably less expensive than installing a new LAN. Televideo and Lift Technologies are two of many companies making very nice-looking terminals with PC graphics and key-boards. The retail prices for these terminals are in the \$500 ranee.

Looking at performance, when I asked people and Alcuelt (which used to be IFT) and at Intel about the terminal-carrying capability of their 80380Xmin-based systems, they stressed the importance of term, they stressed the importance of their people of the stressed that the stressed their stresses when the standard that are disk-intensive, such as database sorting and compiling arge programs, the up a multisaser machine just as they do a LAN file server. They said that in lated circumstances their users. I would say the sum thing about a 305-based LAN server.

According to PC Labs director John Dickinson. "In a multiuser system (goes the theory, and much of the practice), self-and on so several users make heavy CPU or mainline I/O demands at the same time. If they happen to do that, the time-sharing monitor allows them minimal siles of time in which to share the scarce CPU and I/O resource fairly, giving the perception of equal performance."

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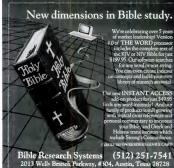
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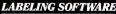
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A SPREADSHEET TAXONOMY In the last of his series, columnist Jim Seymour looks at Lotus's as-yet-unrelead 1-2-3, Release 3, and 1-2-3/G, and he offers tips to help you decide which new program is best for you.

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AFTER HOURS In After Hours we examine some cilcuational programs for children, ranging from the Sikelybear schildren, ranging from the Sikelybear schildren, ranging from the Sikelybear schildren, ranging from the Company and programs, and we take a special look at Terris, an excluding new game that was written in nice for viet Union and is now being distributed learn but hard to stop playing: half of the magazine's staff is already hooked. We offer you some ting gleaned from their extensive hands-on experience, and we even have a counternatury from John C.

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AFTER HOURS





A Poolside Program to Keen Swimmers in Lane

BY EDWARD MENDELSON
Someday, when laptop computers become light and waterproof enough to be used as kick-boards, someone will write a swimming program that you can use Feak Perfarmance: Swim on a computer that sinks like a stone, because this program is designed for use on dy land after a work out in the swimming pool.

For \$79.95, Peak Performance provides coaches and swimmers with a computerized logbook and database. The program records details of each day's workout, lets you know whether you are working near peak capacity, and estimates the number of calories that you

The most useful tool for dedicated swimmers is the program's rough calculation of the intensity of today's workout, so that you can decide whether you should push harder tomorrow or simply take the day off. For each workout you receive a "workout intensity" estimate that is geared to past performance, alone with an estimate

of the extent to which you used your full nerobic capacity. Peak Performance: Swim

Peak Performance: Swim doesn't offer specific suggestions or guidelines, but it can help you make better-informed decisions about your training. Two swimmers can use the copy-protected disks supplied. The copy-protected disks supplied to the swimming pool has to buy extra data disks

at \$10 each. List Price: Peak Performance: Swim, \$79.95. Requires: 128K RAM, one disk drive, DOS 2.0 or Inter. Copy protected. Peak Performance, P. O. Box 60681, Pallo Alio, CA 94306: (415) 424-

CIRCLE 675 ON READER SERVICE CARD



Might and Magic: A Long Time Ago in a Land Far, Far Away . . .

By STEPHANIE K. LOSEE

New World Computing's Might
and Magic might well be the
most exciting castles-andquests movie ever made, but
with one difference: you're not
watching the movie, you're acnually in it.

You begin with a colorful map of the Land of Varn, replete with glaciers, mountains, forests, and castles. You're allowed to take six characters (whose personallities you must first design) on a quest to discover the clustive "Secret of the Inner Sanctum." Each must make a contribution, so be sure to include a soxocere and cleric to cast spells, along with the more battle-ready knight, archer, and patadin. And don't forget a robber—you'll want someone to pick locks and disarm traps along the way.

There are five towns in Vam whose Inns serve as a sort of "home base." Each time you check into an Inn, the experience, weapons, and trinkets your characters have gained along the way are saved, making it worthwhile to visit the nearest Inn frequently. When monsters destroy your party, you can continue the quest from the last Inn in which your characters stayed.

Your quest will take you through underground caverns, over mountains, and across deserts. These passages are constructed like a maze, and you must keep track of your wanderings by mapping your way using 16 by 16 grids. If you get lost, your sorcerer can cast a "location spell" to save your party from certain doom.

Although mapping seems rather confusing at first, it very quickly becomes familiar and fun. If you tire of it, however, you can purchase Might and Magic's Hint Book (\$12.95), which includes not only maps of all 55 sectors of Varn but tips and answers to help you reach higher levels of play. (Newcomers to PC adventure games may be shocked at the idea of being asked to pay for help in using a \$49.95 game, but it's a

common practice.) The program's user interface is so intuitive as to be kind, affording you time to adjust to the program and enjoy learning the basics before it assaults you with complexity. And the EGA graphics are low-resolution but use spectacular color; each new monster or set of scenery is more dazzling (or gruesome) than the previous one. A final rave goes to the manual and Hint Book: both are well written, well organized, and beautifully illustrated.

The program's tendency to crash when your party encount ters an avalanche seems to be its only bug. But I can't complain too much—I got to reboot; my characters, however, were killed.

killed.
List Price: Might and Magic,
\$49.95. Hint Book, \$12.95.
Requires: 256K RAM with CGA,
\$12K RAM with EGA, Iwo floppy
disk drives or a hard disk; DOS 2.1

or later. Copy protected. New World Computing Inc., P.O. Box 2068, Van Nuys, CA 91404; (818) 785-0519.

CIRCLE 674 ON READER SERVICE CARD

On your quest you'll be attooked by one of Might and Magic's resident monitors; the better your performone level, the more monsters you have to fight.



Only one computational software package offers this much versatility.





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Comparing problem-solving packages? Like the knile on the left, most readyto-use packages are designed for specific applications. They perform a narrow range of tasks well, but lack the versatility to tackle diverse or compete problems. An interactive

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ible and is extendable with subroutines in Speakeasy, and with Fortran.

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Call Steve Sogar today at 1-800-227-1209 to discuss your problemsolving needs. Mainframe versions are available for a 2-month free trial; micro versions come with a 2-month money back guarantee.

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AFTER HOURS



Getting to Know Your Diet: A Way to Count Calories and Fat

BY GUS VENDITTO When you're trying to lose weight, it helps to have a gimmick. Take Charge of Your Cholesterol might have the right medicine for you. It wants to make you more conscious of your saturated fat intake, but it can keep tabs on calories, too, and it may make you miserable enough to get you pushing away from the table earlier

The program is based on the book Eater's Choice by Dr. Ron Goor and Nancy Goor and gives you several screens' worth of lectures and dire warnings about heavy fat intake. (Dr. Goor researched the relationship between dietary fat and heart disease for the National Institutes of Health.) Their philosophy is that reducing saturated fat intake leads to lower cholesterol levels, and so the program aims to get saturated fats down to less than 10 percent of your daily diet. Many Americans take in as much as 30 percent of their calories as saturated fat.

And to make sure you read these for-your-own-good lectures, instructions for using the program are sprinkled through

AFTER HOURS INDEX

Peak Performance: Swim Squeezing more out of your Might and Magic Fantasy adventure with graphic surprises

that text and nowhere else in the package. But I've heard it before and found I was able to figure out the dos and don'ts of this program without wading through the sermon: it's all menu-driven and escape reversed. I did find that for a menu-driven program, it has one of the most cantankerous structures to be found any-

Easily Forgiven

But this is a \$34.95 health maintenance program, not a relational database manager, and minor annoyances are easily forgiven if the program delivers. And it

There are two ways to use Take Control of Your Cholesterol: plan a daily regimen that meets your low-fat goals, or track your daily consumption.

I preferred the latter and enjoyed keeping a running tally of the calories and fat in my foods. It determined a healthy caloric and saturated fat allowance for me (based on height, age, and body frame) and ran down the day's harm or benefit to the waistline war.

Tracking foods was tedious at first, but became a pleasant routine in time: You go through a long list of foods, mark off the ones you've eaten (or plan to), and then move to the daily schedule. When you're ready to insert items, the program reels them off and you add them at the right meal, selecting a portion two, three or four times if needed. Calorie and fat accumulation are automatically debited to

your account.

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Take Charge of Your Cholesterol can envisor an ideal diet, or namely track what you're eating

The success of this kind of system depends on the extent of the database, and Take Charge Spartan. has most foods covered. Just about the only food I couldn't find was mayonnaise: other programs spend too much effort et's impact on your body. And

forget the basics If you put yourself on a dict, you're invited to use any of the 200 recipes included, covering soups, entrees, vegetable dishes, and desserts. If you prepare a recipe, simply use its database number when you're tallying your daily consumption.

cataloging prepared foods and

The recipes are really a bonus, but they're handy to have. They specialize in low-fat eating (margarine instead of butter.

egg whites instead of the whole egg) but the regimen is not too

Of course, the only service a program like this can provide is to make you aware of your di-

when you start to see those calories and fats add up, you're ready to start making the hard choices. Use it, and you'll lose. List Price: Take Charge of Your

Cholesterol, \$34.95 Requires: 256K RAM, one disk drive, DOS 2.0 or later. Not copy protected. Concept Development Associates 45 Cordova St., St. Augustine, FL 32084; (904) 825-0220

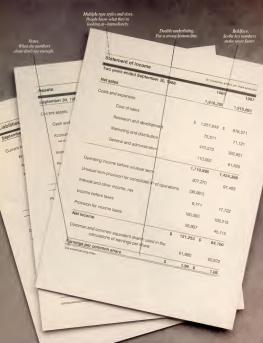
CIRCLE 676 ON BEADER SERVICE CAL

What They Don't Tell You at Wendy's

Ever wonder why fast food doesn't have calories and other nutritional information listed on the side of the box, the way foods like frozen vegetables do? Take a look at the actual numbers and you'll understand why the Colonel doesn't talk about saturated fat in his chicken.

Take Charge of Your Cholesterol includes USDA figures for some fast foods in its calorie/saturated fat counter database: they're enough to make you lose your appetite. A Big Mac has 563 calories, and 155 of them are saturated fat: a Kentucky Fried Chicken dinner (a wing and a thigh) has 902 calories, with 107 saturated fat calories. In short: a man with a medium frame who ate a Big Mac, shake, and fries would consume more than his daily fat allowance in one meal .- Gus Venditto

No other spreadsheet can make this statement...





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The Microsoft* Mouse For the name of your nearest Microsoft dealer call (800) 541-1261, Dent. F91.